

DECUS NO.

8-278

TITLE

SINGLE LENGTH FLOATING POINT PACKAGE

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DATE

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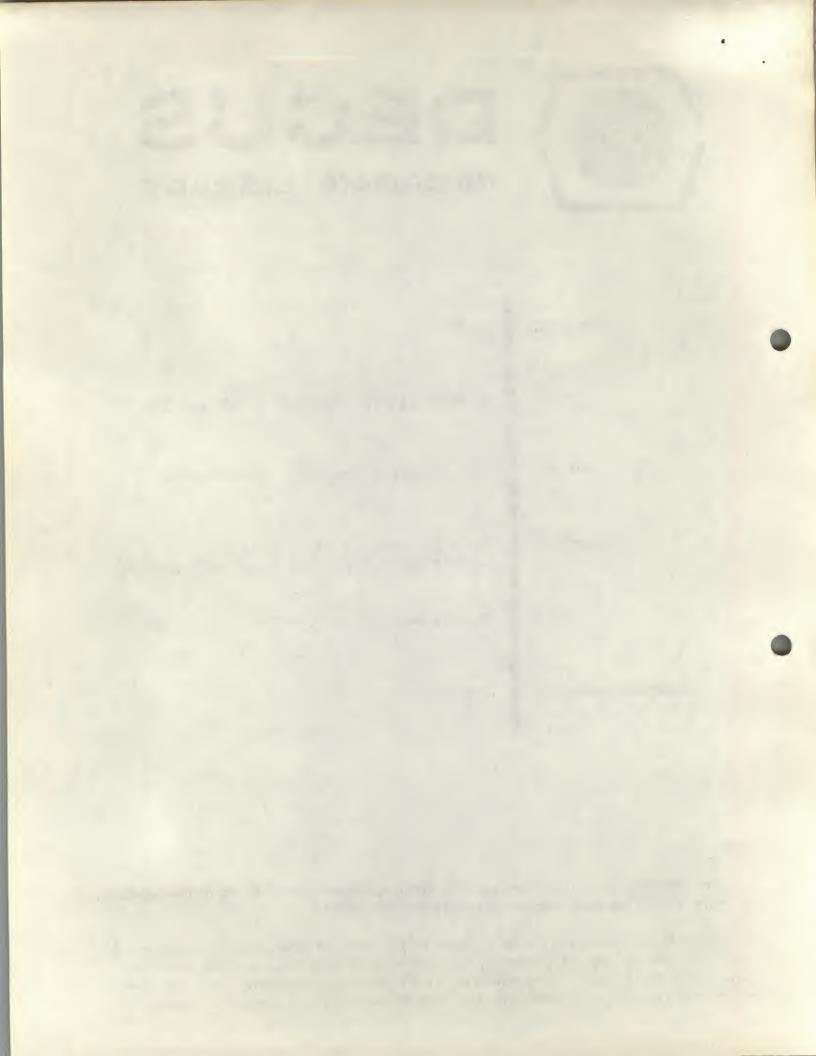
SOURCELANGUAGE

PAL III

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SINGLE LENGTH FLOATING POINT PACKAGE

DECUS Program Library Write-up

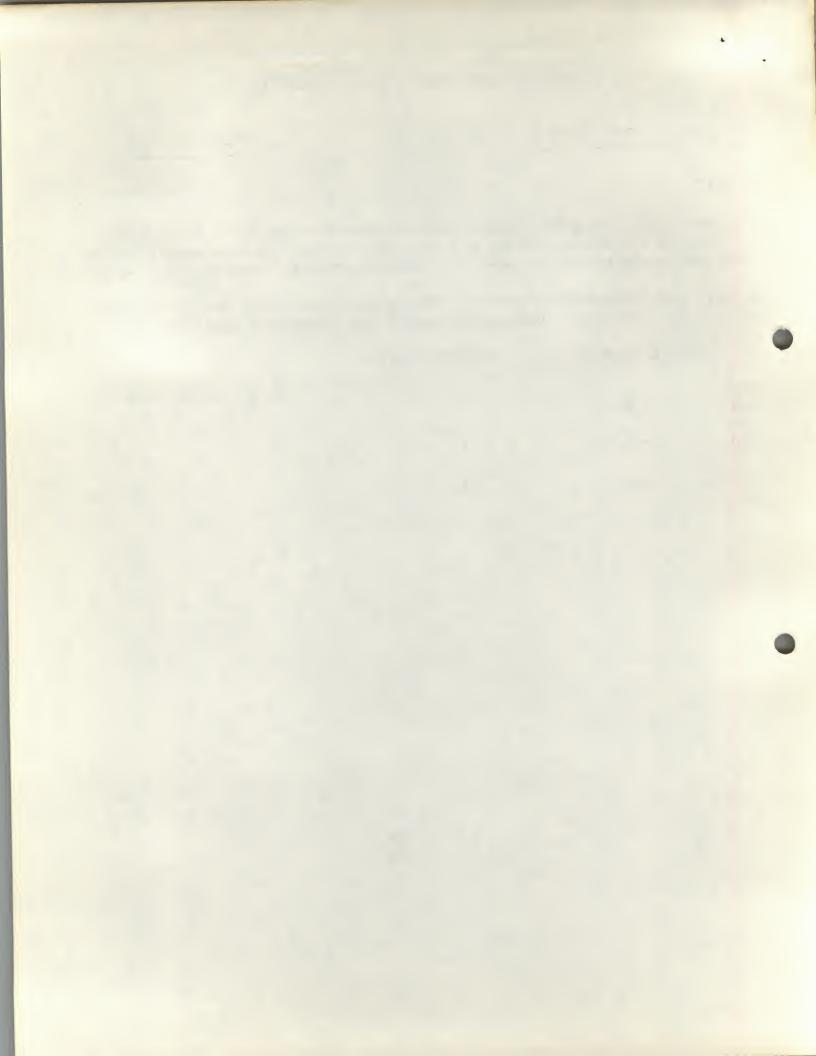
DECUS No. 8-278

ABSTRACT

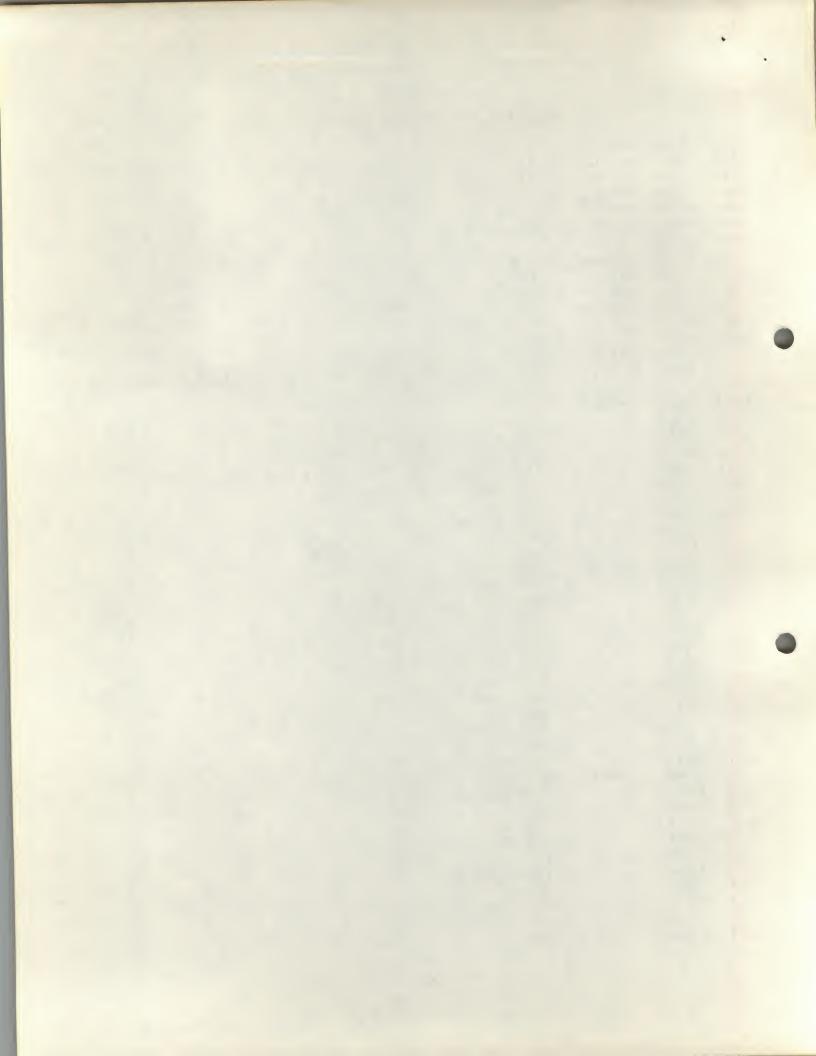
This Single Length Floating Point Package consists of a modified version of DEC-Ø8-YQ1A-PB and is intended as an alternative where input and output accuracy is adequately served by single length working. Entry points and commands are identical with the standard double length version.

Increased speed of calculation is its merit for the program was developed for on-line calculations employing ADC's and DAC's. Typical improvements in execution time are listed below:

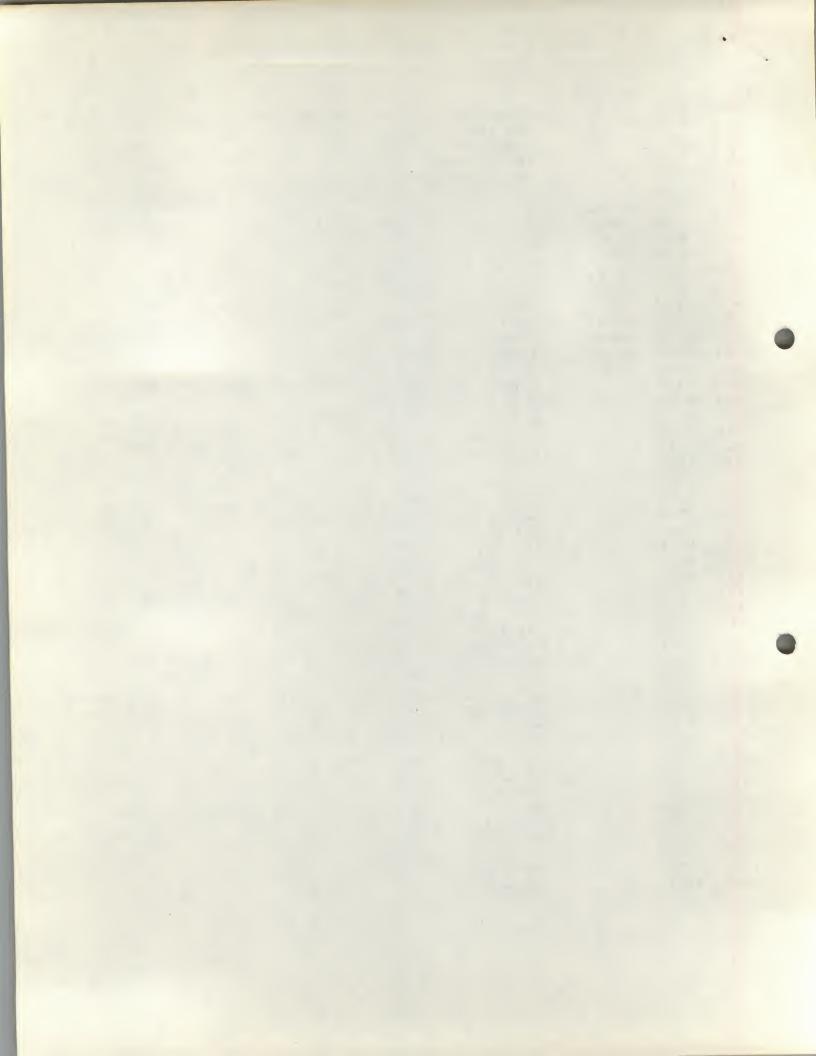
FADD 1.2 2.4	IGTH
FSUB 2.Ø 3.25 FMPY Ø.4 4.ØØ FDIV 2.25 4.4	
FSQT 3.6 13.5	



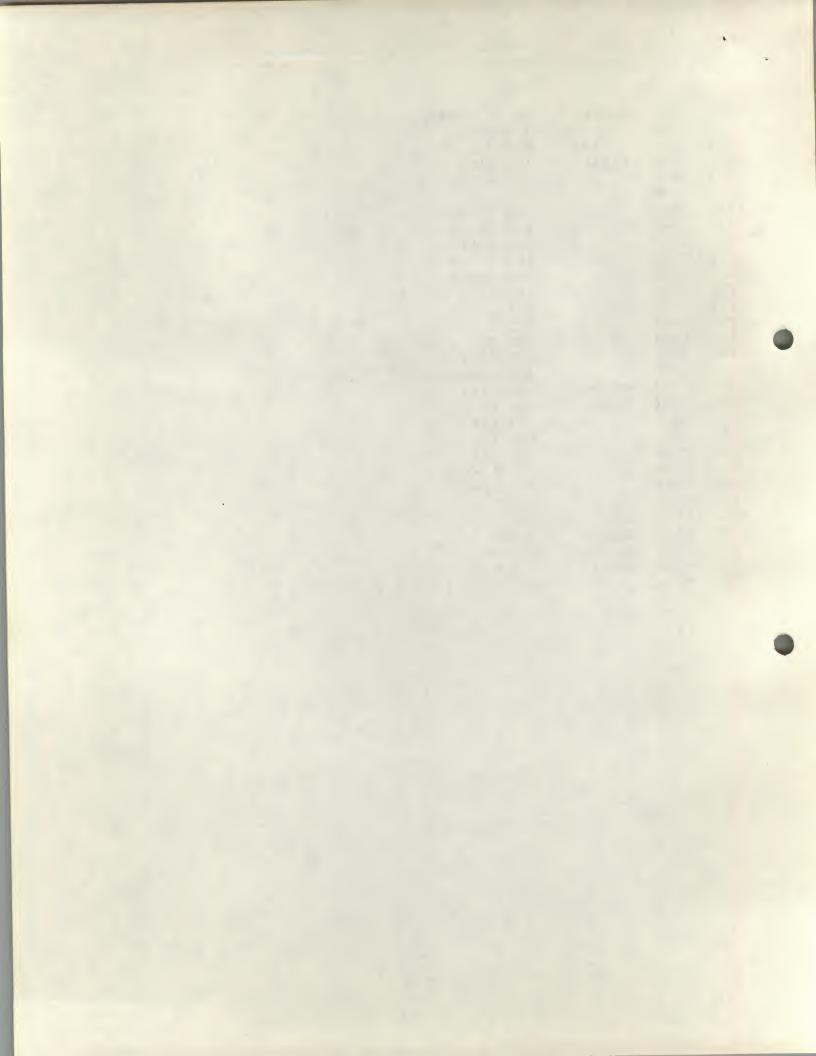
```
/FLOATING POINT ARITHMETIC INTERPRETER
               *40
  0040
        0000
               EX1,
                          0
  0041
        aaaa
               AC1H,
 0042
        0000
              ACIL,
                          0
 0043
        0000
               OVER1,
                          0
 0044
        0000
              EXP,
 9945
       0000
              HORD,
                          0
 0046
       0000
              LORD,
                          0
 0047
        0000
              OVER2,
                          0
 0050
        0000
              EXP1,
                          0
 0051
        0000
              QUOL,
                          0
 9952
       0000
              FPACI,
                          0
 0053
        0000
                          0
 0054
       0000
                          0
              *61
 0061
       0000
              FLAG.
                         0
                                                /ARITHMETIC ERROR FLAG
              *5600
 5600
       0000
              FPNT,
                         0
 5601
       7300
                         CLA CLL
 5602
       3042
                         DCA ACIL
 5603
       3046
                         DCA LORD
 5694
       1600
                         TAD I FPNT
                                               / GET NEXT INSTRUCTION
 5695
       3250
                         DCA JUMP
 5606
       1250
                         TAD JUMP
 5607
       0260
                         AND PAGENO
5610
       7650
                         SNA CLA
                                               / PAGE ZERO
5611
       5214
                         JMP .+3
                                               /YES
5612
       1256
                         TAD MASKS
5613
       0200
                         AND FPNT
5614
       3253
                         DCA ADDR
5615
       1257
                         TAD MASK 7
5616
       0250
                        AND JUMP
5617
       1253
                        TAD ADDR
5620
      3253
                        DCA ADDR
5621
      1261
                        TAD INDRCT
5622
       0250
                        AND JUMP
5623
      7650
                        SNA CLA
5624
      5227
                        JMP LOOPOI
5625
      1653
                        TAD I GODR
5626
      3253
                        DCA ADDR
5627
             LOOP01.
      2200
                        ISZ FPNT
5630
      1653
                        TAD I ADDR
5631
      3040
                        DCA EXI
5632
      1253
                        TAD ADDR
5633
      3254
                        DCA SAVE
      2254
5634
                        ISZ SAVE
5635
      1654
                        TAD I SAVE
5636
      3041
                        DCA AC1H
5637
      1250
                        TAD JUMP
5640
      7106
                        CLL RTL
5641
      7996
                        RTL
```



```
5642 0255
                         AND MASK3
                                            / GET THE OP CODE
  5643
       1262
                         TAD TABLE
  5644
       3251
                         DCA JUMP2
 5645
       1651
                        TAD I JUMP2
 5646
       3251
                        DCA JUMP2
 5647
       5651
                        JMP I JUMPS
 5650
       0000
              JUMP,
 5651
       0000
              JUMP2,
                        0
 5652
       0000
             G02,
                        0
 5653
       0000
             ADDR.
                        0
 5654
       9999
             SAVE
                        0
 5655
       0017
             MASK3,
                        0017
 5656
      7600
             MASK5,
                        7600
 5657 0177
             MASK7,
                        0177
 5660 0200
             PAGENO,
                        0200
 5661
      0400
             INDRCT.
                        0400
 5662
       5663
             TABLE,
                        .+1
 5663
      5726
                        EXIT
 5664
       5706
                        FLAD
 5665
      5723
                        FLSU
 5666
      5745
                        FLMY
 5667
       6240
                        FLDV
 5670
      5673
                        FLGT
 5671
      5700
                        FLPT
 5672
       5757
                        NORF
 5673
      1040 FLGT.
                        TAD EX1
 5674
       3044
                        DCA EXP
5675
      1041
                        TAD ACIH
5676
      3945
                       DCA HORD
5677
      5201
                       JMP FPNT+1
5700
      1044
             FLPT,
                       TAD EXP
5701
      3653
                       DCA I ADDR
5702
      2253
                       ISZ ADDR
5703
     1045
                       TAD HORD
5704
      3653
                       DCA I ADDR
5705
      5201
                       JMP FPNT+1
5706
     4755 FLAD,
                       JMS I ALGN
5707
      5201
                       JMP FPNT+1
5710
      4756
                       JMS I UNORM
5711
      7100
                       CLL
5712
      1042
                       TAD ACIL
5713
      1046
                       TAD LORD
5714
      3046
                       DCA LORD
5715
     7004
                       RAL
5716
      1041
                       TAD ACIH
5717
      1045
                       TAD HORD
5720
      3045
                       DCA HORD
5721
      4754
                       JMS I NORM
5722
      5201
                       JMP FPNT+1
```

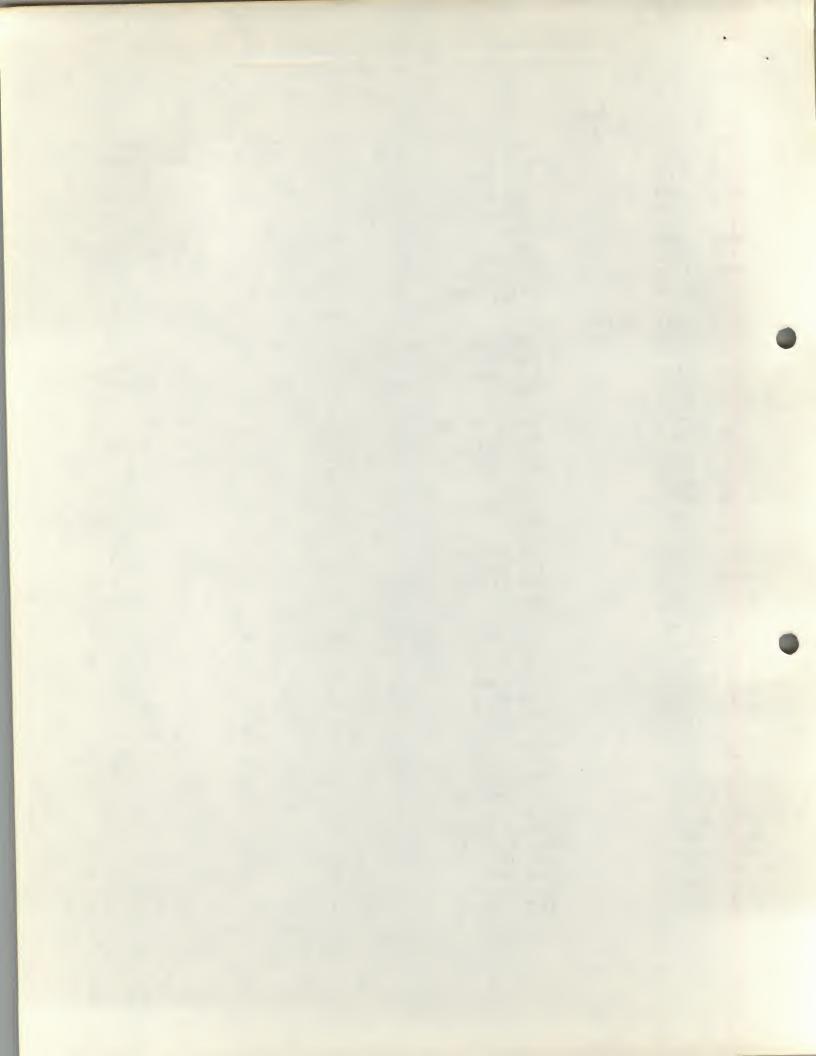


5723	4725	FLSU,	JMS I OPMINS
5724	5306		JMP FLAD
5725	6400	OPMINS,	MINUS2
5726	1250	EXIT,	TAD JUMP
5727	0255		AND MASK3
5730	7450		SNA
5731	5600		JMP I FPNT
5732	1344		TAD ACON6
5733	3251		DCA JUMP2
5734	1651		TAD I JUMP2
5735	3251		DCA JUMP2
5736	1200		TAD FPNT
5737			DCA GO2
5740	4651		JMS I JUMPS
5741	1252		TAD GO2
5742	3200		DCA FPNT
5743	5201		JMP FPNT+1
	6516		TABLE 6-1
	7201	FLMY,	CLA IAC
5746	1040		TAD EX1
5747	1044		TAD EXP
5750	3044		DCA EXP
5751	4753		JMS I MULT
5752			JMP FPNT+1
5753	6216	MULT.	DMULT
5754	6600	NORM.	DNO RM
5755		ALGN.	ALIGN
		UNORM,	DUNORM
	4754	NORF,	JMS I NORM
5760	5201		JMP FPNT+1

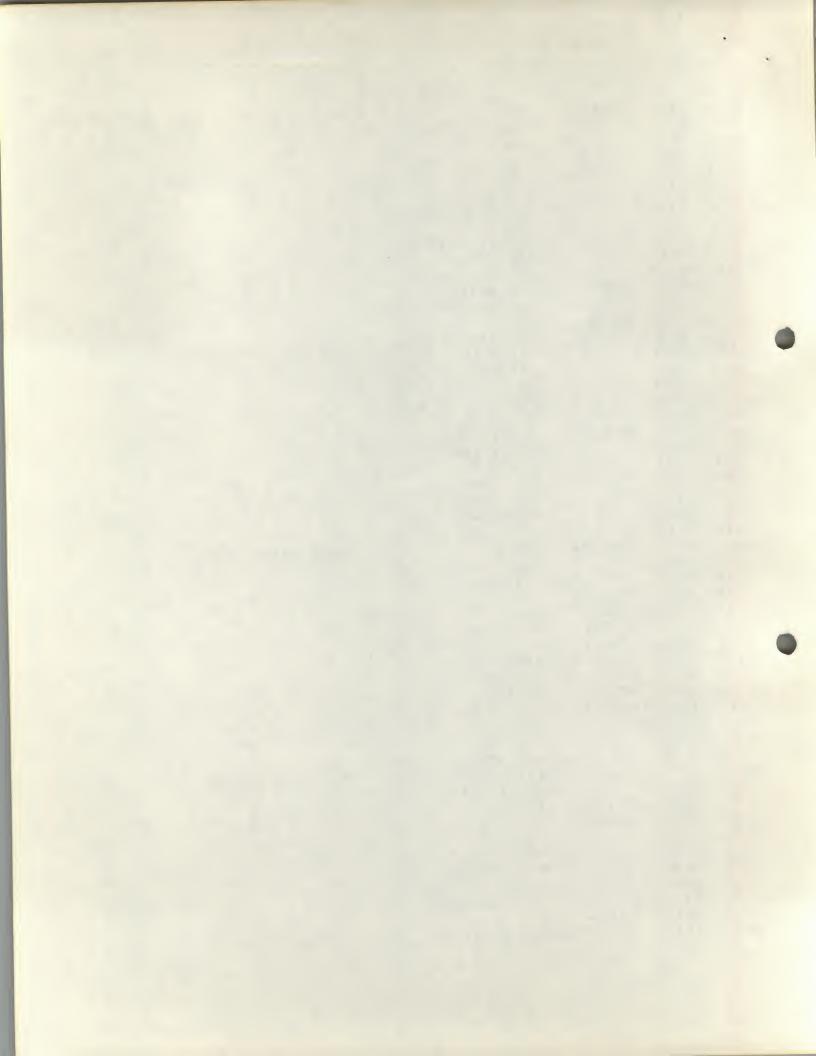


		*6000	
600		ACMINS,	0
600			CLL CLA
600			TAD LORD
600:			CMA IAC
600			DCA LORD
6009			TAD HORD
6006			CMA
6007			SZL
6010			CLL IAC
6011			DCA HORD
6012	5600		JMP I ACMINS
			TOTAL TOTAL
6013		ALIGN.	0
6014			TAD HORD
6015			SNA CLA
6016	42 C) # C)		JMP NOHERE
6017			TAD ACIH
6020			SNA CLA
6021			JMP I ALIGN
6022			TAD EX1
6023			CMA IAC
6024	1944		TAD EXP
6025			SNA
6026	5273		JMP DONE
6027	7500		SMA
6030	7041		CIA
6031	3316		DCA AMOUNT
6032	1316		TAD AMOUNT
6033	1317		TAD TEST2
6034	7700		SMA CLA
6035	5243		JMP .+6
6036	4275		JMS OUTGO
6037	7430	•	SZL
6949	1322		TAD TAG1
6041	1323		TAD TAGE
6042	5304		JMP NOGO
6044	4275		JMS OUTGO
6045	7420		SNL
6846	1323		TAD TAGE
6047	1322		TAD TAG1
6050	3320		DCA TEST3
6051	1316		TAD AMOUNT
6052	7041		CIA
6053	1720 3720		TAD I TEST3
6954	2320		DCA I TEST3
6055	1329		ISZ TEST3
6056	3321		TAD TEST3
6057	2321		DCA TEST4
	and had the of		ISZ TEST4

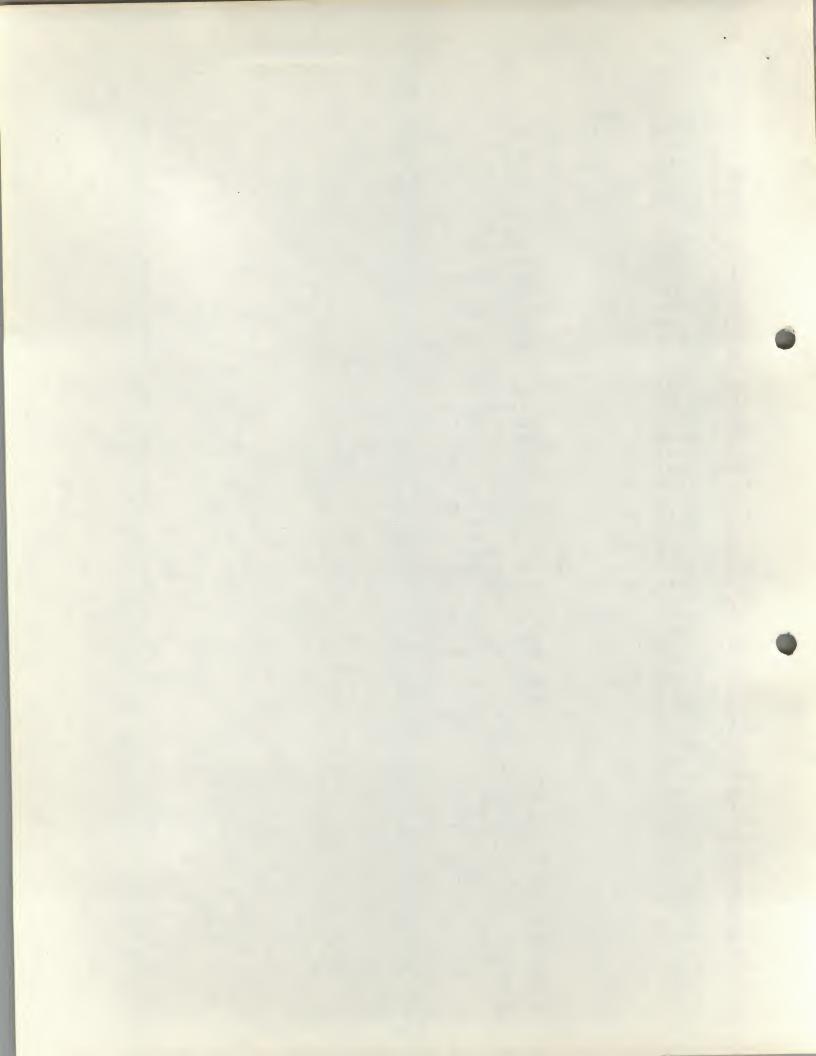
/ROUTINE TO PERFORM DOUBLE PRECE /NEGATION OF FLOATING ACC



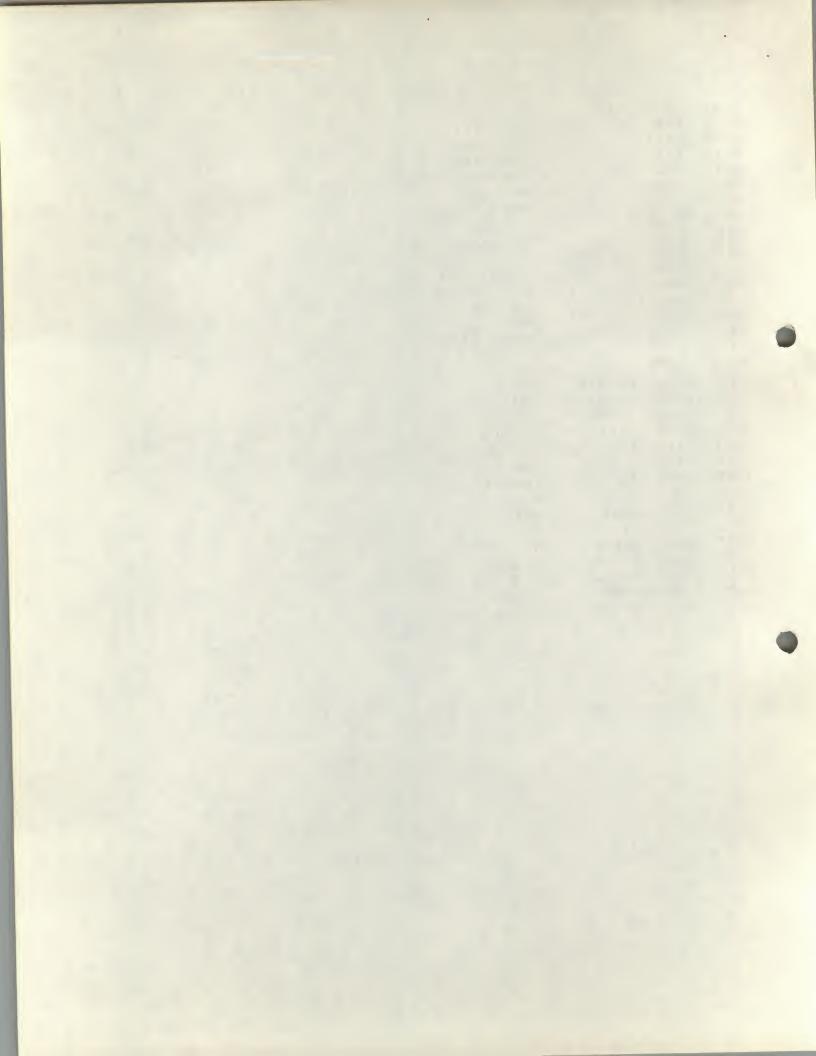
```
6969
        7100 SHIFT,
                        CLL
                                            /THIS ROUTINE DOES THE SHIFTING
 6961
       1720
                        TAD I TEST3
  6962
       7519
                        SPA
  6063
       7020
                        CML
 6064
       7010
                        RAR
 6965
       3720
                        DCA I TEST3
 6966
       1721
                        TAD I TESTA
 6967
       7010
                        RAR .
 697A
       3721
                        DCA I TEST4
 6971
       2316
                        ISZ AMOUNT
 6072
      5260
                        JMP SHIFT
 6073
            DONE.
      2213
                        ISZ ALIGN
 6074
       5613
                        JMP I ALIGN
 6075
      0000
             OUTGO,
                        0
 6076
       1040
                        TAD EXI
 6077
       7041
                        CIA
 6100
      1044
                        TAD EXP
 6191
      7004
                        RAL
 6102
       7200
                       CLA
 6103
       5675
                       JMP I OUTGO
 6104 3320
             NOGO.
                       DCA TEST3
 6105
      1720
                       TAD I TEST3
 6196
      3044
                       DCA EXP
 6107
      2320
                       ISZ TEST3
 6110 1720
                       TAD I TEST3
 6111
      3045
                       DCA HORD
6112
     5613
                       JMP I ALIGN
6113
     1949
            NOHERE,
                       TAD EX1
                                            /MANTISSA IS ZERO
6114
      3044
                       DCA EXP
6115
      5273
                       JMP DONE
6116
     0000
            AMOUNT,
                       0
6117
      0014
            TEST2,
                       14
6120 0000 TEST3,
                       0
6121 0000 TEST4.
                       M
6122 0044
            TAG1,
                       EXP
6123
      7774
            TAG2,
                       EX1-EXP
6124 5601
            RETN2.
                       FPNT+1
6125
     1333
            ERROR1,
                      TAD GOOF
6126
      3044
                       DCA EXP
6127
      1333
                       TAD GOOF
6130
     3045
                       DCA HORD
     2061
6131
                      ISZ FLAG
                                           /SET ERROR FLAG
6132
     5724
                      JMP I RETN2
6133
     3777 GOOF,
                       3777
6134
     0000 SOUARE,
                      0
6135
      4407
                      JMS I 7
6136
      6052
                      FPUT FPACI
6137
      3052
                      FMPY FPAC1
6149
      0000
                      FEXT
6141
      5734
                      JMP I SQUARE
6142 0000
           EXIT6.
                      0
6143
     5742
                      JMP I EXIT6
```



```
*6200
  6200
        9000
               DIVI.
                           0
  6201
        7300
                           CLA CLL
  6292
        1045
                           TAD HORD
  6203
        7510
                           SPA
  6204
        7120
                          CLL CML
 6295
        7019
                          RAR
 6206
        3045
                          DCA HORD
 6207
        1046
                          TAD LORD
 6210
        7010
                          RAR
 6211
        3046
                          DCA LORD
 6212
        7100
                          CLL
 6213
        2044
                          ISZ EXP
 6214
        7000
                          NOP
 6215
        5600
                          JMP I DIVI
 6216
        0000
              DMULT,
                          0
 6217
        7300
                          CLA CLL
 6220
        1312
                          TAD SMACLA
 6221
        3276
                          DCA SNSWIT
 6222
       4265
                          JMS SIGN
 6223
       1041
                          TAD ACIH
 6224
       3705
                          DCA I MP2PT
 6225
       1045
                          TAD HORD
 6226
       4704
                          JMS I MP4PT
6227
       3046
                          DCA LORD
6230
       1706
                          TAD I MPSPT
6231
       .3045
                          DCA HORD
6232
       4707
                          JMS I NORMF
6233
       3046
                          DCA LORD
6234
       2314
                          ISZ SGN
6235
       5616
                         JMP I DMULT
6236
       4722
                         JMS I MINS
6237
       5616
                         JMP I DMULT
62.40
       1041
              FLDV.
                         TAD AC1H
6241
       7650
                         SNA CLA
6242
       5723
                         JMP I ERROR
6243
       1040
                         TAD EX1
6244
       7041
                         CMA IAC
62.45
       1044
                         TAD EXP
6246
       7001
                         IAC
6247
       3944
                         DCA EXP
6250
       1311
                         TAD SPACLA
6251
       3276
                         DCA SNSWIT
62.52
       4265
                         JMS SIGN
6253
       4710
                         JMS I DIVIDE
6254
      1706
                         TAD I MPSPT
6255
      1041
                         TAD ACIH
6256
      7630
                         SZL CLA
6257
      7001
                         IAC
6260
      3041
                         DCA AC1H
6261
      2314
                         ISZ SGN
6262
      4722
                         JMS I MINS
6263
      5664
                         JMP I .+1
6264
      571A
                         FLAD+2
                                      7
```

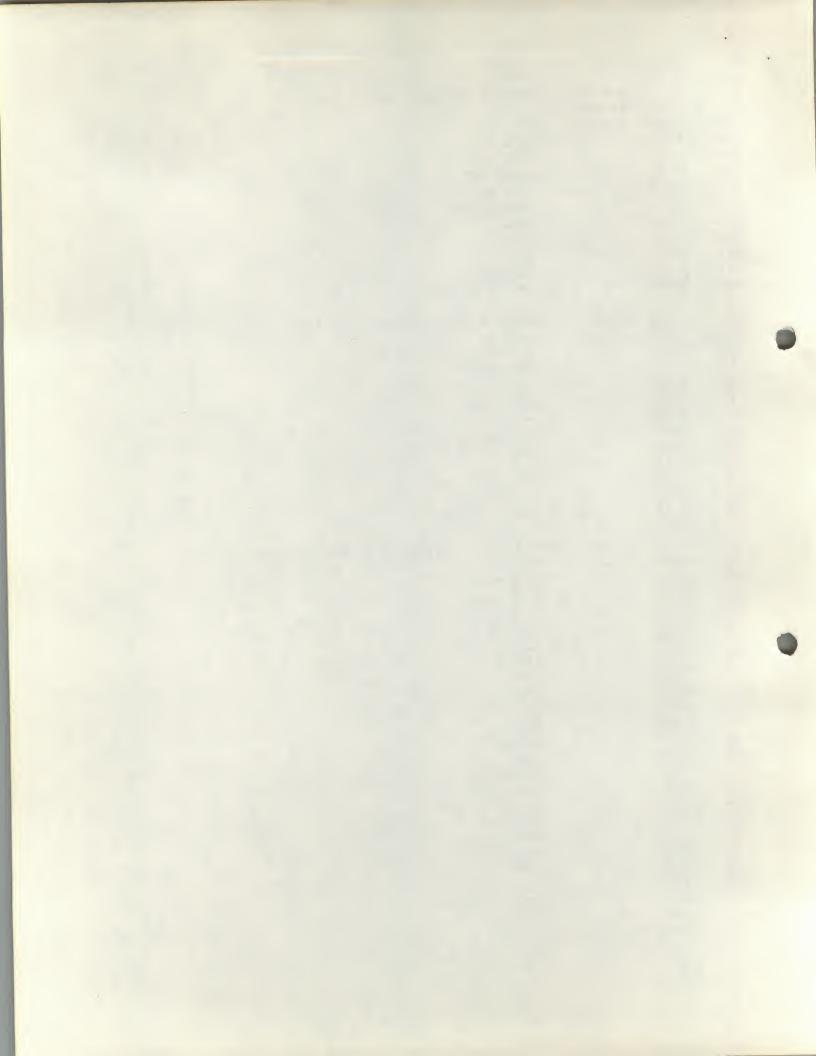


```
6265
        aaaa
               SIGN,
                          0
 6266
        1315
                          TAD REST
 6267
        3314
                          DCA SGN
 62.70
        1045
                          TAD HORD
 6271
        7700
                          SMA CLA
 6272
        5275
                          JMP .+3
 6273
        4722
                          JMS I MINS
 6274
        2314
                         ISZ SGN
 6275
        1041
                         TAD ACIH
 6276
       7700
              SNSWIT,
                         SMA CLA
 6277
       5665
                         JMP I SIGN
 6300
       4720
                         JMS I MINS2
 6301
       2314
                         ISZ SGN
 6302
       7000
                         NOP
 6303
       5665
                         JMP I SIGN
6304
       6427
             MP4PT,
                         MP4
6395
       6461
             MP2PT,
                         MP2
6306
      6455
             MP5PT,
                         MP5
6307
       6600
             NORMF,
                         DNORM
6310
      6462
             DIVIDE,
                         DUBDIV
6311
       7710
             SPACLA,
                         SPA CLA
6312
       7700
             SMACLA,
                        SMA CLA
6313
      5601
             RETURN,
                        FPNT+1
6314
      0000
             SGN.
                        0
6315
      7776
             REST,
                        7776
6316
      9000
             D,
                        0
6317
      0000
             KEEP,
                        0
6320
      6400
             MINS2,
                        MINUSS
6321
      6413
             RARZ,
                        DIVS
6322
      6000
             MINS.
                        ACMINS
6323
      6125
             ERROR,
                        ERROR1
```

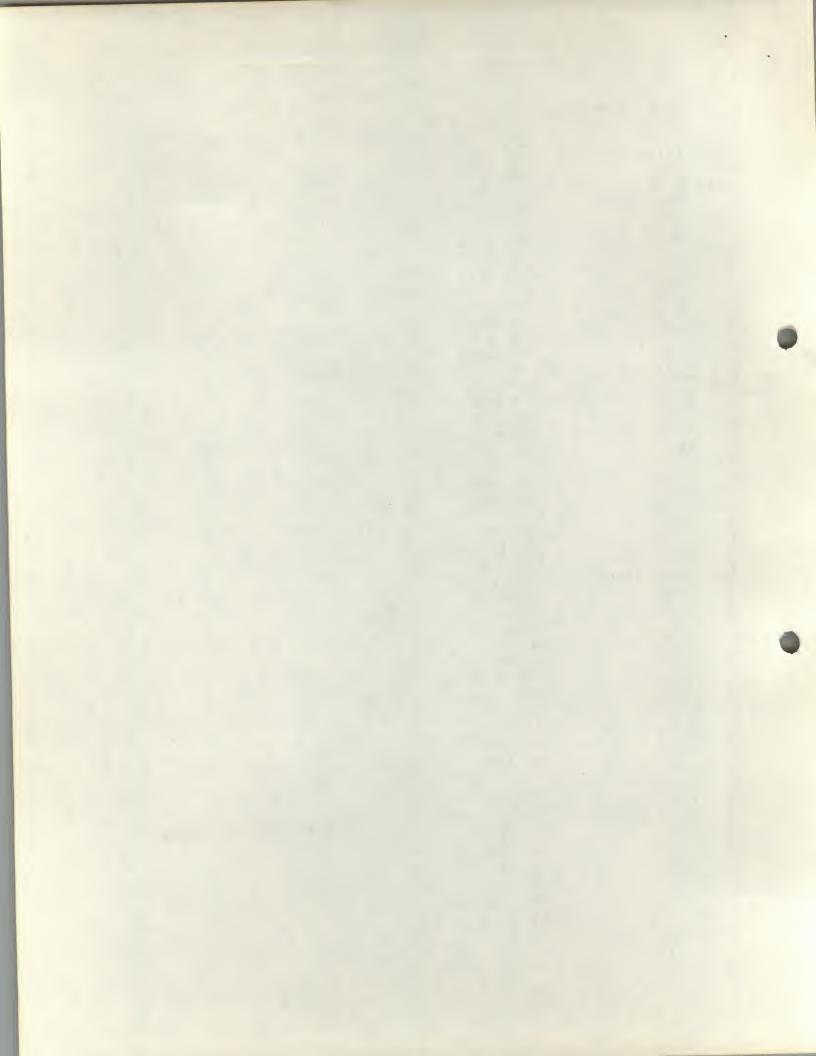


```
/NEGATE OPERAND, DOUBLE PRECISION
               *6400
  6400
        0000
               MINUS2,
  6491
        7300
                          CLA CLL
  6402
        1042
                          TAD ACIL
  6403
        7041
                          CMA IAC
  6404
        3042
                          DCA ACIL
 6405
        1041
                          TAD AC1H
 6406
        7040
                          CMA
 6407
        7430
                          SZL
 6410
       7101
                          CLL IAC
 6411
        3041
                          DCA ACIH
 6412
        5600
                          JMP I MINUSE
              /SHIFT OPERAND RIGHT, DOUBLE PRECISION
 6413
        0000
              DIV2.
                          0
 6414
        7300
                          CLA CLL
 6415
       1041
                          TAD AC1H
 6416
       7510
                          SPA
 6417
        7120
                          CLL CML
 6420
       7019
                          RAR
 6421
       3041
                          DCA ACIH
 6422
       1042
                         TAD ACIL
 6423
       7010
                         RAR
 6424
       3042
                         DCA ACIL
 6425
       7100
                         CLL
 6426
       5613
                         JMP I DIV2
              /SINGLE PRECISION MULTIPLY, 12 BY 12 BITS
6427
       9090
              MP4,
                         0
6439
       3256
                         DCA MP1
6431
       3255
                         DCA MP5
6432
       1260
                         TAD THIR
6433
       3257
                         DCA MP3
6434
       7100
                         CLL
6435
       1256
                         TAD MP1
6436
       7010
                         RAR
6437
       3256
                         DCA MP1
6440
      1255
                         TAD MP5
6441
       7420
                         SNL
6442
       5245
                        JMP .+3
6443
      7100
                        CLL
6444
      1261
                        TAD MP2
6445
      7010
                        RAR
6446
      3255
                        DCA MP5
6447
      2257
                        ISZ MP3
6450
      5235
                        JMP MP4+6
6451
      1256
                        TAD MP1
6452
      7010
                        RAR
6453
      7100
                        CLL
6454
      5627
                        JMP I MP4
6455
      0000
            MP5,
                        0
6456
      0000
             MP1,
                        3
6457
      0000
             MP3.
                        0
6460
      7764
             THIR,
                        7764
6461
      0000
            MP2,
                                     9
```

PAUSE



```
6462
         adag DUBDIV,
   6463
        7300
                         CLA CLL
  6464
        3051
                         DCA QUOL
  6465
         1316
                         TAD MIF
  6466
        3257
                         DCA MP3
  6467 5273
                         JMP DVX
  6470
        1045
              DV3,
                         TAD HORD
  6471
        7004
                         RAL
  6472
        3045
                         DCA HORD
  6473
       1045
              DVX.
                         TAD HORD
  6474
        1041
                         TAD ACIH
  6475
       7420
                         SNL
  6476
       5300
                         JMP DV2-1
  6477
        3045
                         DCA HORD
  65AA
        7200
                         CLA
  6501
       1051
              DV2,
                         TAD QUOL
  6502
       7004
                        RAL
  6503
       3051
                        DCA QUOL
 6504
       2257
                        ISZ MP3
 65/15
       5270
                        JMP DV3
 6506
       1045
                        TAD HORD
 6507
       7190
                        CLL
 651A
       7006
                        RTL
 6511
       3255
                        DCA MP5
 6512
       1951
                        TAD QUOL
 6513
      3045
                        DCA HORD
 6514
      1255
                        TAD MP5
 6515
       5662
                        JMP I DUBDIV
 6516 7765 MIF,
                        7765
 6517 6134 TABLE6,
                        SQUARE
 6520
      6651
                        SOROOT
 6521 6142
                        EXIT6
 6522 6142
                        EXIT6
6523 6142
                       EXIT6
6524
      6142
                       EXIT6
6525 6142
                       EXIT6
6526 6142
                       EXIT6
6527
      6142
                       EXIT6
6530 6142
                       EXIT6
6531 6142
                       EXIT6
6532
     6142
                       EXIT6
     6142
6533
                       EXIT6
6534
     6142
                       EXIT6
6535
      6142
                       EXIT6
6536 0000
           DUNORM,
                       M
                                            / SHIFT OPERAND RIGHT
6537
     4213
                       JMS DIV2
6540
     4744
                      JMS I RAR1
6541
      2940
                      ISZ EX1
6542
      7000
                      NOP
6543
      5736
                      JMP I DUNORM
6544
     6200 RAR1,
                      DIVI
```



```
*6600
               SUBROUTINE TO NORMALISE FLOATING ACC
  6690
        0000
               DNO RM.
                          0
  6601
        7300
                          CLA CLL
  6602
        3250
                          DCA AMTI
  6693
        3247
                          DCA SIGNI
  6694
        1045
                         TAD HORD
  6605
        7510
                         SPA
                                               /IS MANTISSA NEG
  6606
        2247
                         ISZ SIGNI
 6607
        7649
                         SZA CLA
                                               /IS MANTISSA ZERO
  6610
       5215
                         JMP GO 6
 6611
       1046
                         TAD LORD
 6612
       7640
                         SZA CLA
 6613
       5215
                         JMP GO 6
 6614
       5244
                         JMP EXITS
 6615
       1247
              GO 6.
                         TAD SIGNI
 6616
       7649
                         SZA CLA
 6617
                                               INEG?
      4646
                         JMS I NEG
 6620
      1045
                                              / YES
             LOP,
                        TAD HORD
 6621
       7194
                         RAL CLL
 6622
       7710
                        SPA CLA
 6623
       5234
                        JMP EXIT1
 6624
       1946
                        TAD LORD
6625
      7004
                        RAL
6626
      3046
                        DCA LORD
6627
      1045
                        TAD HORD
6630
      7004
                        RAL
6631
      3045
                        DCA HORD
6632
      2250
                        ISZ AMT1
6633
      5229
                        JMP LOP
6634
      1250
            EXIT1.
                        TAD AMT1
6635
      70.41
                        CMA IAC
6636
      1044
                        TAD EXP
6637
      3044
                        DCA EXP
6649
      1247
                        TAD SIGNI
                                             INEG?
6641
      7640
                       SZA CLA
6642
      4646
                       JMS I NEG
```

JMP I DNORM

JMP I DNORM

DCA EXP

ACMINS

0

6643

6644

6645

6646

6650

6647 0000

5600

3044

5600

6000

0000

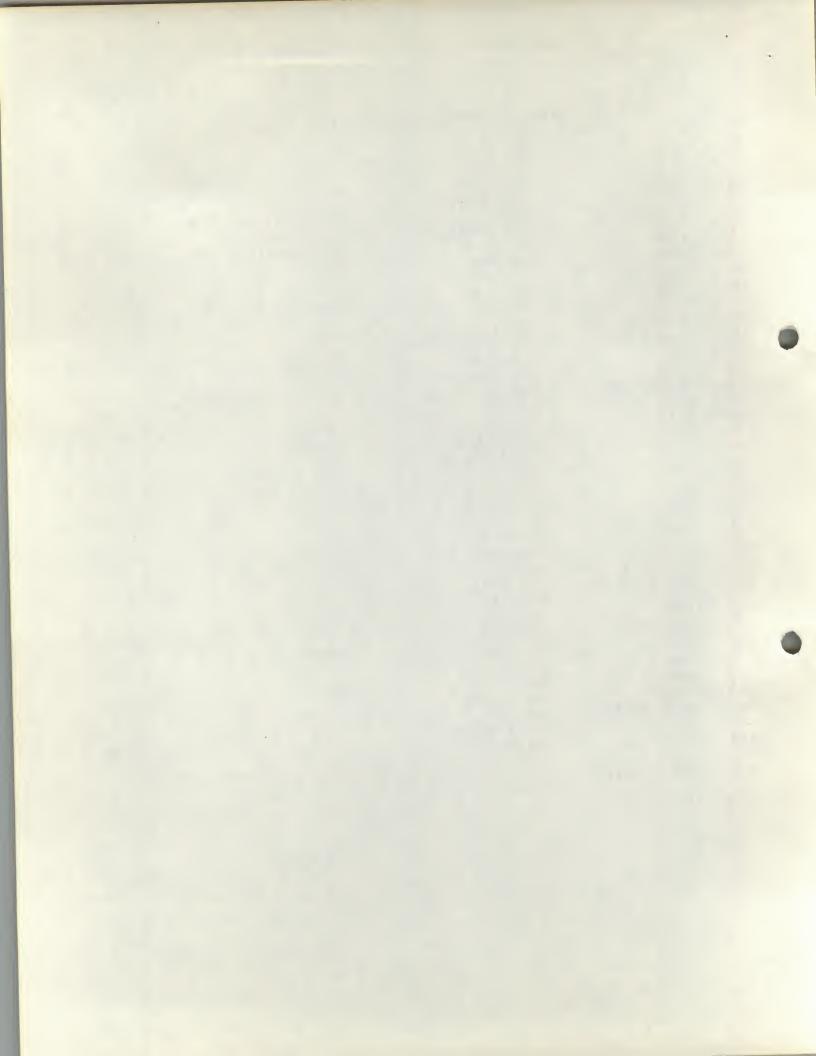
EXIT2,

SIGNI.

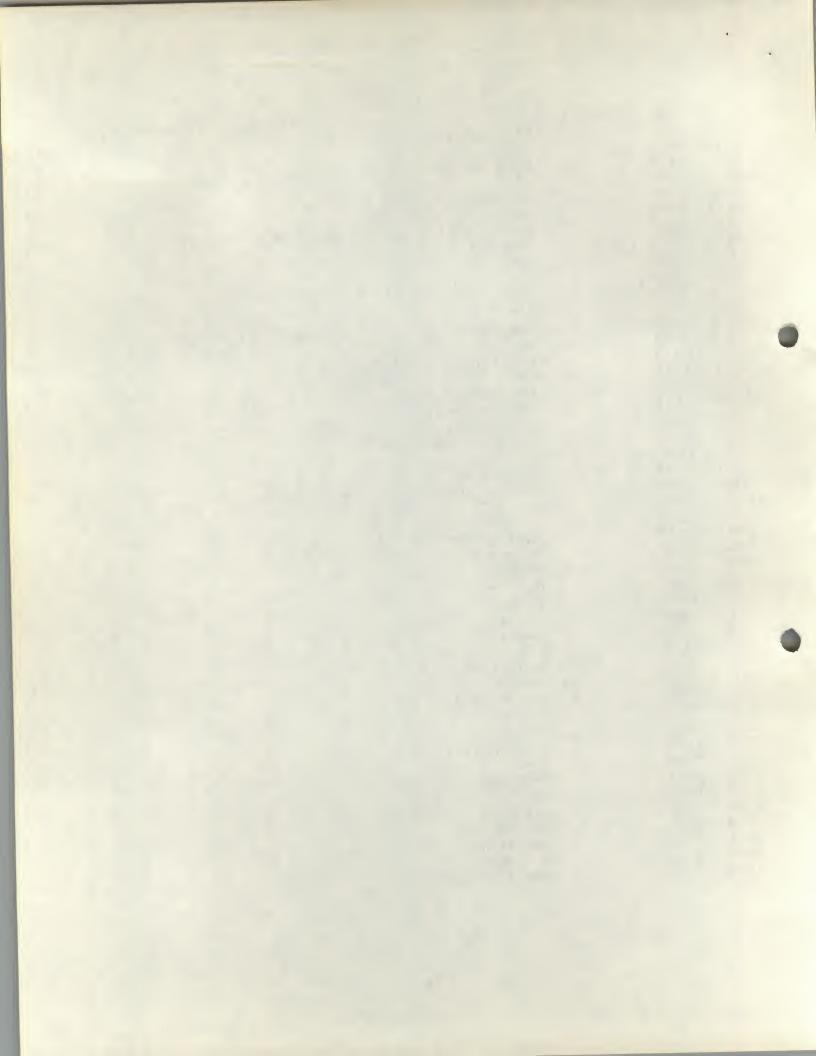
AMT1.

NEG.

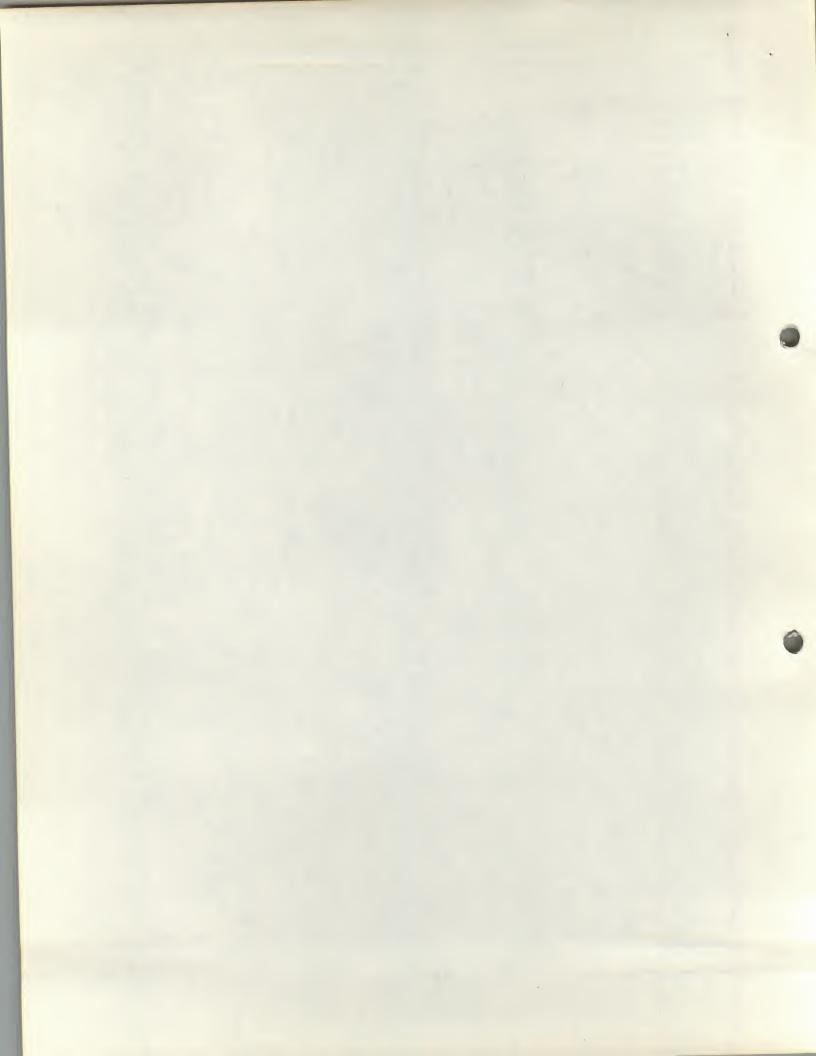
/YES



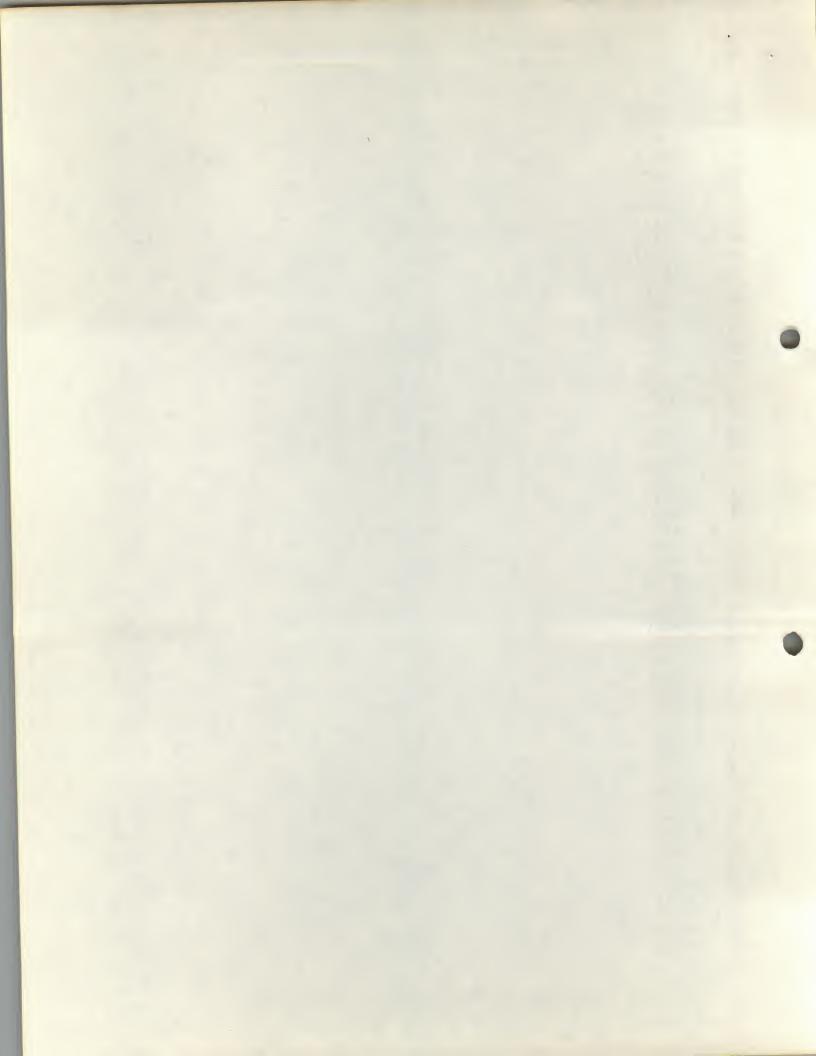
```
6651 0000 SOROOT,
                        2
                                             /FLOATING SQUARE ROOT
  6652 3346
                        DCA FLAGI
  6653 4407
                        JMS I 007
  6654 6052
                        FPUT FPACI
  6655
        0000
                        FEXT
  6656 10145
                        TAD HORD
  6657
        7710
                        SPA CLA
  6660 5335
                        JMP SGENDI
                                           /NUMBER IS NEGITIVE
  6661
      1944
                        TAD EXP
 6662 7100
                        CLL
 6663
      7510
                        SPA
 6664 7020
                        CML
 6665 7010
                        RAR
 6666
       3342
                       DCA ITERI
                                           /MAKE FIRST APPROX
 6667
      7430
                        SZL
 6670 2342
                       ISZ ITER1
 6671
       7000
                       NOP
 6672
      1345
                       TAD SOCON1
 6673 3343
                       DCA ITER1+1
 6674 3344
                       DCA ITER1+2
 6675
      1053
                       TAD FPAC1+1
 6676
      7640
                       SZA CLA
 6677 5301
                       JMP CLCU
 6700
      5340
                       JMP SOEND
                                           / NUMBER=0
 6701
     4407 CLCU,
                       JMS I 7
 6702 5052
                       FGET FPACI
 6703
     4342
                       FDIV ITER1
 6704
     1342
                       FADD ITER1
 6705
      0000
                       FEXT
6706
      7240
                      CLA CMA
6707
      1044
                      TAD EXP
6710 3044
                      DCA EXP
6711
      1044
                      TAD EXP
6712
     7041
                      CMA IAC
6713
      1342
                      TAD ITERI
6714
     7640
                      SZA CLA
6715
      5331
                      JMP ROOTGO
6716
      1045
                      TAD HORD
6717
     7041
                      CMA IAC
6720 1343
                      TAD ITER1+1
6721
      7500
                      SMA
6722
     7041
                      CMA IAC
6723
      7001
                      IAC
6724
      7710
                      SPA CLA
6725
      5331
                      JMP ROOTGO
6726 1346
                      TAD FLAGI
6727
     3061
                     DCA FLAG
6730
     5651
                     JMP I SOROOT
```



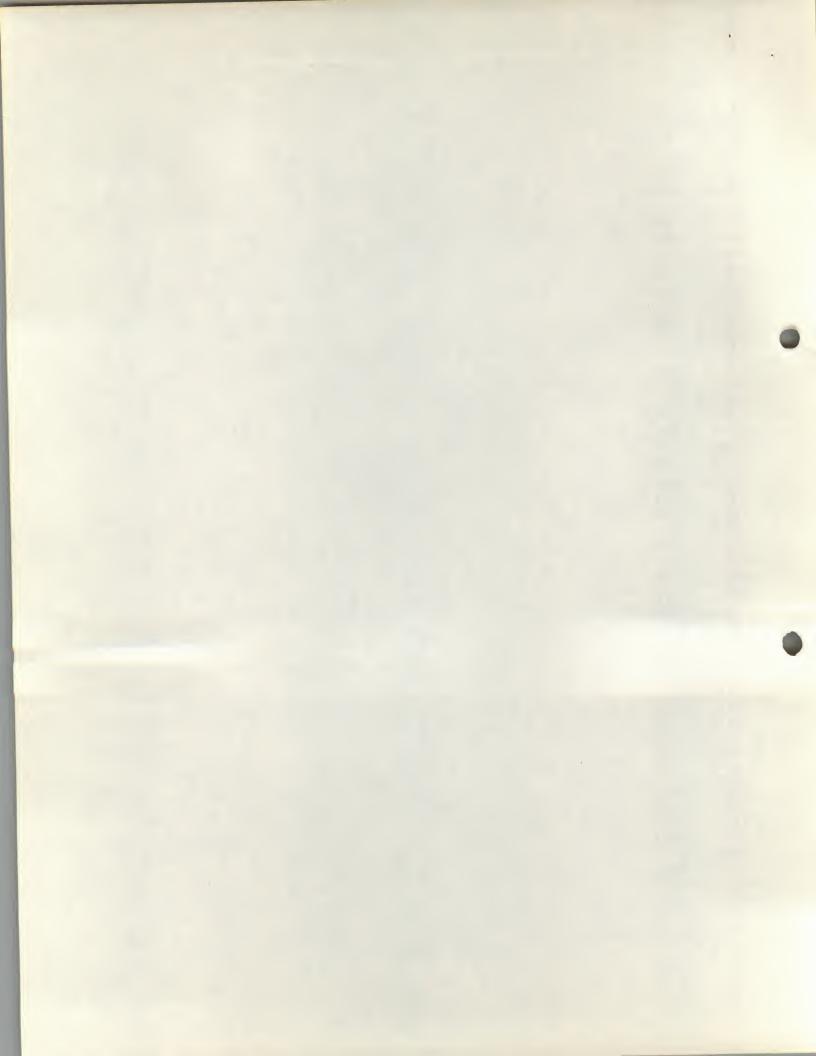
6731	4407	ROOTGO,	JMS I 7
6732	6342		
6733	0000		FPUT ITER1
6734	5301		FEXT
6735	4646	SOEND1.	JMP CLCU
6736	2346	2 GEMDI	JMS I NEG
6737	5253		ISZ FLAGI
6740		0.0	JMP SOROOT+2
6741	3044	SOEND,	DCA EXP
	5651		JMP I SOROOT
6742	0000	ITER1.	0
6743	0000		0
6744	0000		0
6745	3015	SOCON1.	3015
6746	0000	FLAGI.	0



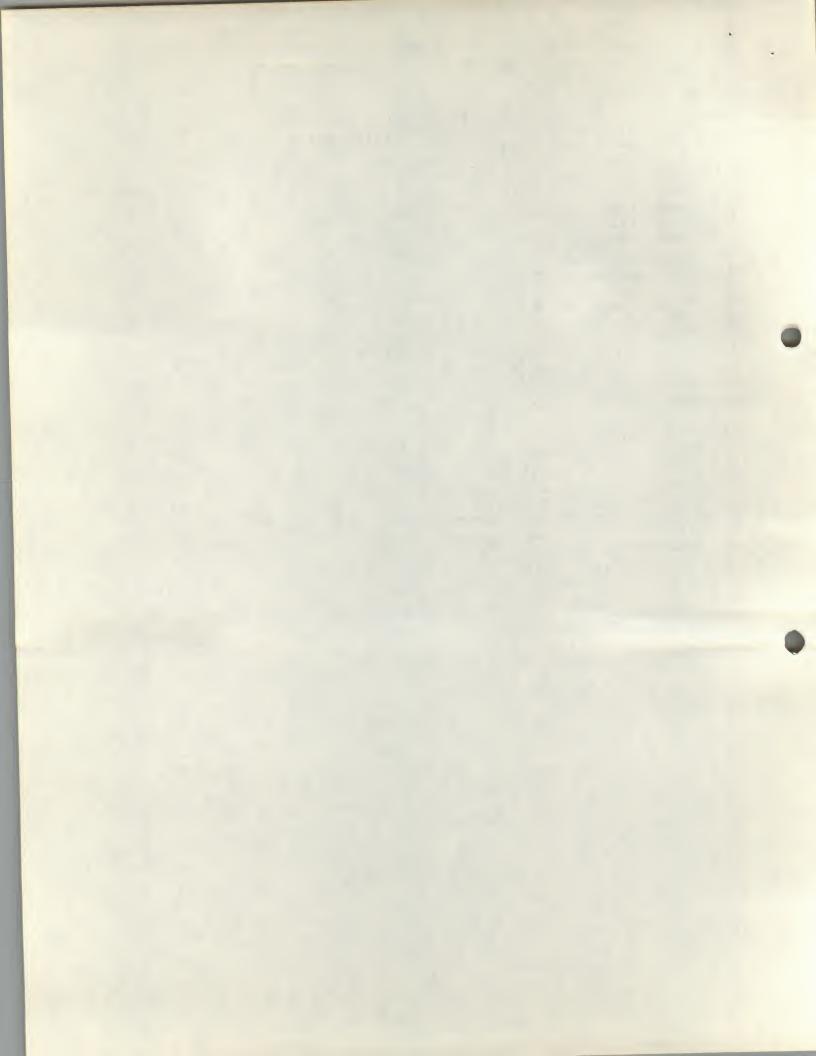
ACMIN	5 6000
ACON6	
ACIH	
	0041
AC1L	0042
ADDR	5653
ALGN	5755
ALIGN	
AMOUNT	0.70
AMT1	6650
CLCU	6701
D	6316
DIVIDE	
DIVI	6200
DIV2	
	6413
DMULT	6216
DNORM	6600
DONE	6073
DURDIV	6462
DUNORM	
DVX	0000
	6473
DV2	6501
DV3.	6470
ERROR	6323
ERROR1	6125
EXIT	5726
EXIT1	
	6634
EXITS	6644
EXIT6	6142
EXP	0044
EXP1	9050
EX1	0040
FLAD	
	5706
FLAG	0061
FLAG1	6746
FLDV	6240
FLGT	5673
FLMY	5745
FLPT	5700
LSU	
	5723
PAC1	0052
PNT	5600
OOF	6133
503	5652
06	
ORD	6615
	0045
NDRCT	5661
TERI	6742
UMP	5650
UMP2	5651
EEP	6317
00001	5.00
00101	5627
OP	6620
ORD	0046



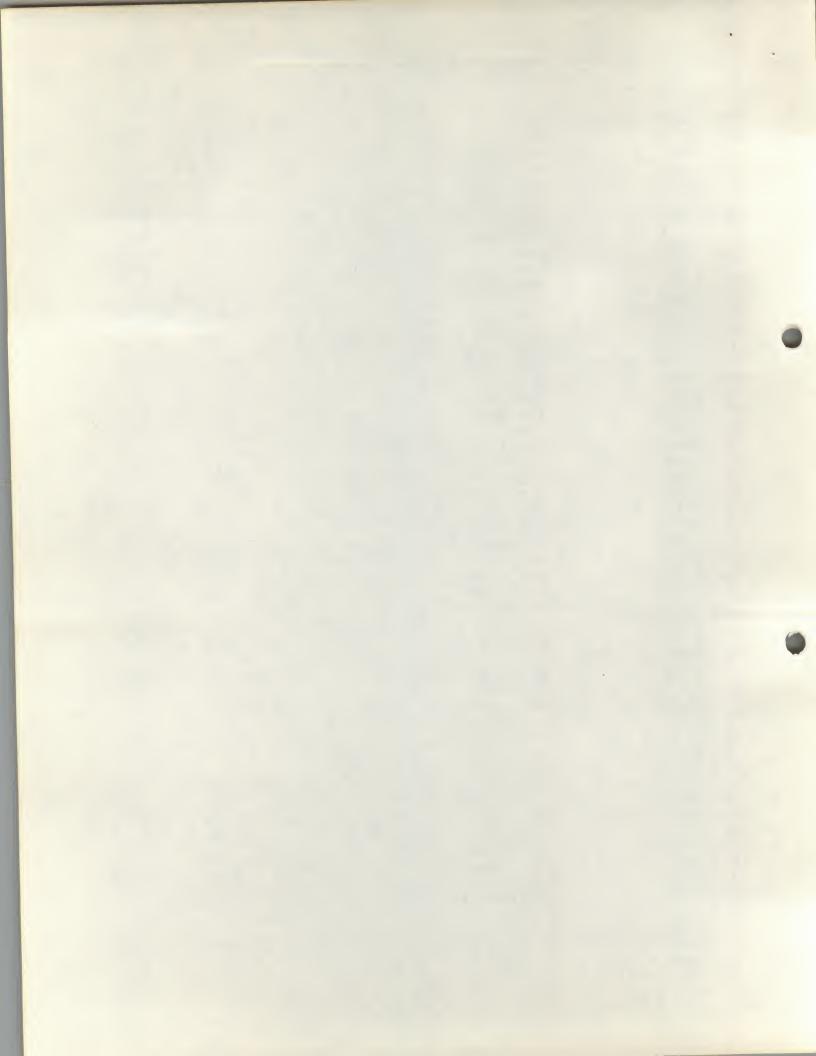
*** ***	
MASK3	5655
MASK5	5656
	- 000
MASK 7	
MIF	6516
MINS	
	6322
MINSS	6320
MINUS	
MP1	6456
MP2	6461
MPSPT	6305
MP3	6457
MP4	
	6427
MP4PT	6304
MP5	
	6455
MPSPT	6306
MULT	5753
NEG	6646
NO GO	6104
NOHERE	6113
NORF	5757
NORM	
	5754
NORMF	6307
OPMINS	5725
OUTGO	6075
OVER1	0043
OVERS	
	0047
PAGENO	5660
QUOL	
	0051
RAR1	6544
RAR2	6321
REST	6315
RETN2	6124
RETURN	
	6313
ROOTGO	6731
SAVE	5654
SGN	6314
SHIFT	6060
SIGN	
	6265
SIGN1	6647
SMACLA	6312
SNSWIT	6276
SPACLA	6311
SPCONI	-
	6745
SOEND	6740
SOEND1	6735
SOROOT	6651
SOUARE	6134
TABLE	
	5662
TARLE6	6517
TAG1	6122
TAGE	6123
TEST2	6117
TEST3	
	6180
TEST4	6121
THIR	6460
LINORM	5756



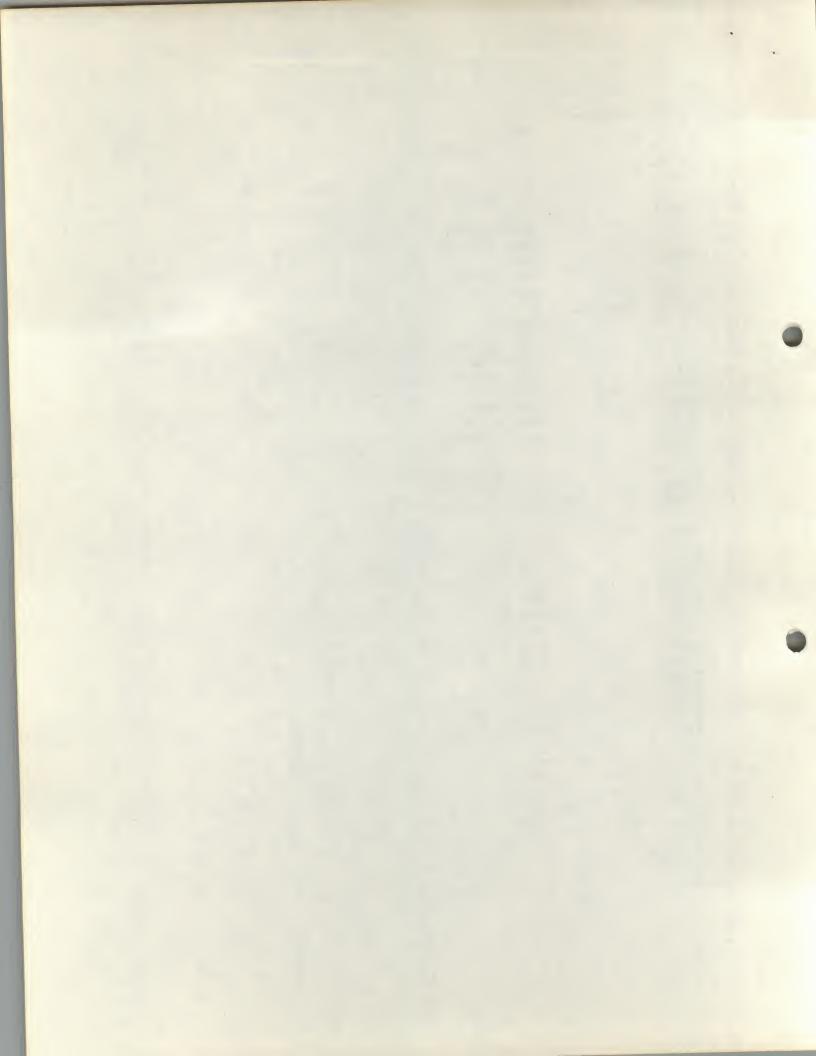
```
/FLOATING POINT INPUT/OUTPUT ROUTINES
              /REQUIRES FLOATING POINT INTERPRETER
              PENTRY AT 0007
              *5
 0005
        7400
                         7400
 0006
        7200
                         7200
 0007
        5600
              FPNT,
                         5600
              *44
 0044
       0000
              EXPONT,
 0045
       0000
              HORDER,
                         0
 0046
       0000
              LORDER.
              *52
 9952
       0000
              FPACI,
                         0
 0053
       0000
                         0
 0054
       0000
                         0
 0055
       7777
              SWIT1,
                         7777
 0056
       7777
             SWITZ,
                        7777
 0057
       0000
              CHAR,
                        3
9060
       0000
              DSWIT,
                        0
             *6767
.6767
       0000
             PRCHAR,
6770
       1956
                        TAD SWITZ
6771
      7650
                        SNA CLA
6772
      5767
                        JMP I PRCHAR
6773
      1377
                        TAD LFED
6774
      4776
                        JMS I OPUT
6775
      5767
                        JMP I PRCHAR
6776
      7344
            OPUT,
                        OUT
6777
      0212
            LFED,
                        0212
```



```
7000
        0000
               DECONV.
                           0
  7001
        7200
                          CLA
  7002
        3045
                          DCA HORDER
  7003
        3046
                          DCA LORDER
  7004
        3265
                          DCA SIGN
  7005
        3266
                          DCA DNUMBR
  7006
        4342
                          JMS INPUT
 7007
        1336
                          TAD PLUS
 7010
        7450
                          SNA
 7011
        5217
                          JMP DECON
 7012
        1335
                          TAD MINUS
 7013
        7440
                          SZA
 7014
        5229
                          JMP . + 4
 7015
        7240
                          CLA CMA
 7016
        3265
                          DCA SIGN
 7017
        4342
              DECON.
                          JMS INPUT
 7020
       7200
                          CLA
 7021
       1057
                          TAD CHAR
 7022
       1337
                          TAD MIN9
 7023
        7500
                          SMA
 7024
       5600
                          JMP I DECONV
 7025
       1340
                          TAD PLUS12
 7026
       7510
                          SPA
 7027
       5600
                         JMP I DECONV
 7030
       3263
                         DCA DIGIT
 7031
       1045
                         TAD HORDER
 7032
       0341
                         AND MASK
 7033
       7449
                         SZA
7934
       5217
                         JMP DECON
7035
       2060
                         ISZ DSWIT
7036
       2266
                         ISZ DNUMBR
7037
       4241
                         JMS MULTIO
7040
       5217
                         JMP DECON
7041
       0000
             MULT10.
                         0
7042
       1046
                         TAD LORDER
7043
       3261
                         DCA LTEMP
7044
       1045
                         TAD HORDER
7045
       3262
                         DCA HTEMP
7046
       3264
                         DCA REMAIN
7047
       4267
                         JMS MULTS
7050
       4267
                         JMS MULT?
7051
       4303
                         JMS DUBLAD
7052
       4267
                         JMS MULT2
7053
       1263
                         TAD DIGIT
7054
      3261
                         DCA LTEMP
7655
      3262
                         DCA HTEMP
7956
      4303
                         JMS DUBLAD
7057
      1264
                        TAD REMAIN
7060
      5641
                        JMP I MULTIO
7061
      9999
             LTEMP,
                        0
7862
      9999
             HTEMP,
                        0
7063
      0000
             DIGIT.
                        0
7064
      0000
             REMAIN.
                        0
                                      17
7065
             SIGN.
      0000
                        0
7066
      0000
             DNUMBR.
```

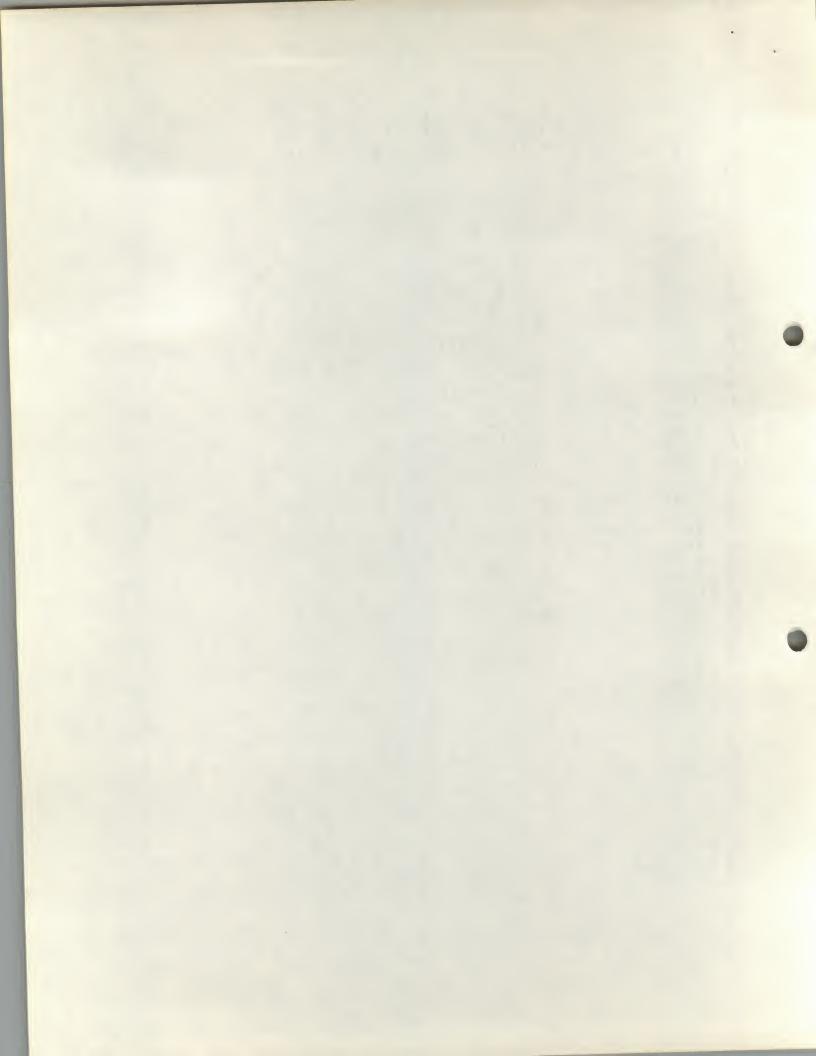


7067	0000	MULT2,	Ø
7.070	7300		CLA CLL
7071			TAD LORDER
7072			RAL
7073			DCA LORDER
7074			TAD HORDER
7075			RAL
7076			DCA HORDER
7077			TAD REMAIN
7100			RAL
7101			DCA REMAIN
7102			JMP I MULTS
7103		DUBLAD,	Ø
7104			CLA CLL
7105			TAD LORDER
7106	_		TAD LTEMP
7107			DCA LORDER
7111			RAL
7112	1045		TAD HORDER
7113			TAD HTEMP
7114			DCA HORDER
	1264		RAL
7116			TAD REMAIN
7117			DCA REMAIN
	0.170		JMP I DURLAD
7120	0000	MSIGN.	(1)
7121			CLA CLL
7122			ISZ SIGN
	5720		JMP I MSIGN
	1046		TAD LORDER
	7041		CMA IAC
7126			DCA LORDER
7127			TAD HORDER
7130			CMA
7131			SZL
7132	7001		IAC
7133 7134			DCA HORDER
7134	5720		JMP I MSIGN
7135	7776	MINUS.	-2
7136	7525	PLUS,	-253
7137	7506	MIN9,	-272
7148	0012	PLUS12,	12
7141	7600	MASK.	7600



/INPUT A CHARACTER, IF CR, TEST /INPUT SWITCH TO SEE IF LF SHOULD /BE TYPED. IF RUBOUT, RESTART INPUT.

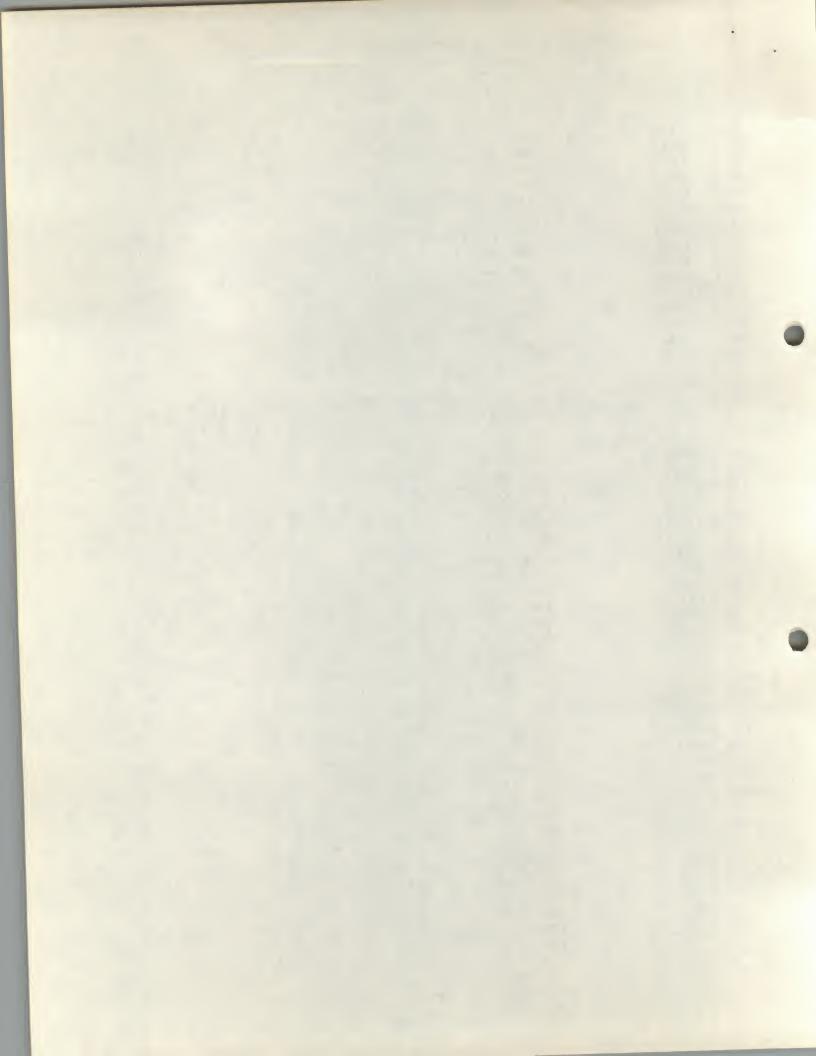
_			
7142	0000	INPUT,	0
7143	7200		CLA
7144	6031		KSF
7145			JMP1
7146			KRB
7147			DCA CHAR
	1057		TAD CHAR
7151			JMS I OUTPUT
7152			TAD CHAR
7153			SNA
7154	- 0		JMP INPUT+1
	1370		TAD MRBOUT
7156			SNA
	5767		JMP I RESTRT
	1371		TAD MINCR
7161			SNA CLA
	4765		JMS I PRINT
	1057		TAD CHAR
7164	5742		JMP I INPUT
			111101
7165	6767	PRINT,	PRCHAR
7166	7344	OUTPUT,	OUT
7167	7401	RESTRT.	FLINTP+1
7170	7401	MRBOUT,	-377
7171	0162		377-215
7172	7300	ROU,	CLA CLL
7173	1046		TAD LORDER
7174	7710		SPA CLA
7175			ISZ HORDER
7176			JMP I .+1
7177	7575		LFLINT



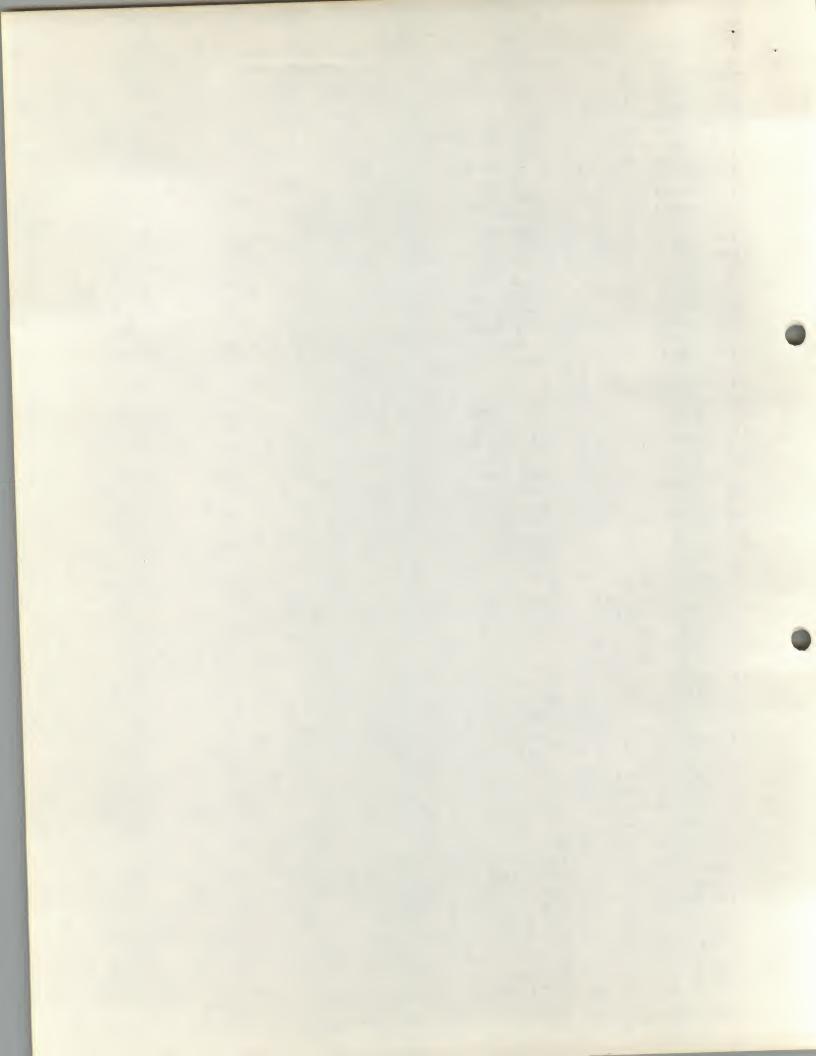
```
/FLOATING OUTPUT "E" FORMAT
            /USES: TSF
                      JMP . - 1
                       TLS
           *7200
7200 0000 FLOUTP, 0
7291
    4217
                   JMS FOUTCN
7202 1324
                    TAD REXP
7203 3044
                   DCA EXPONT
7204
    1343
                   TAD CHE
7205 4344
                   JMS OUT
72.96 4737
                    JMS I FEXPPT
7207 1055
                   TAD SWIT1
7210 7650
                   SNA CLA
                  JMP I FLOUTP
7211 5600
7212 1341
                   TAD CARRTN
7213 4344
                   JMS OUT
7214 1342
                   TAD LNFEED
7215 4344
                   JMS OUT
7216 5600
                    JMP I FLOUTP
```

/THIS WHOLE SUBROUTINE MAY BE ALTERED TO BUFFER /TE OUTPUT DIGITS: CHANGE JMS OUTDG TO DCA I 10

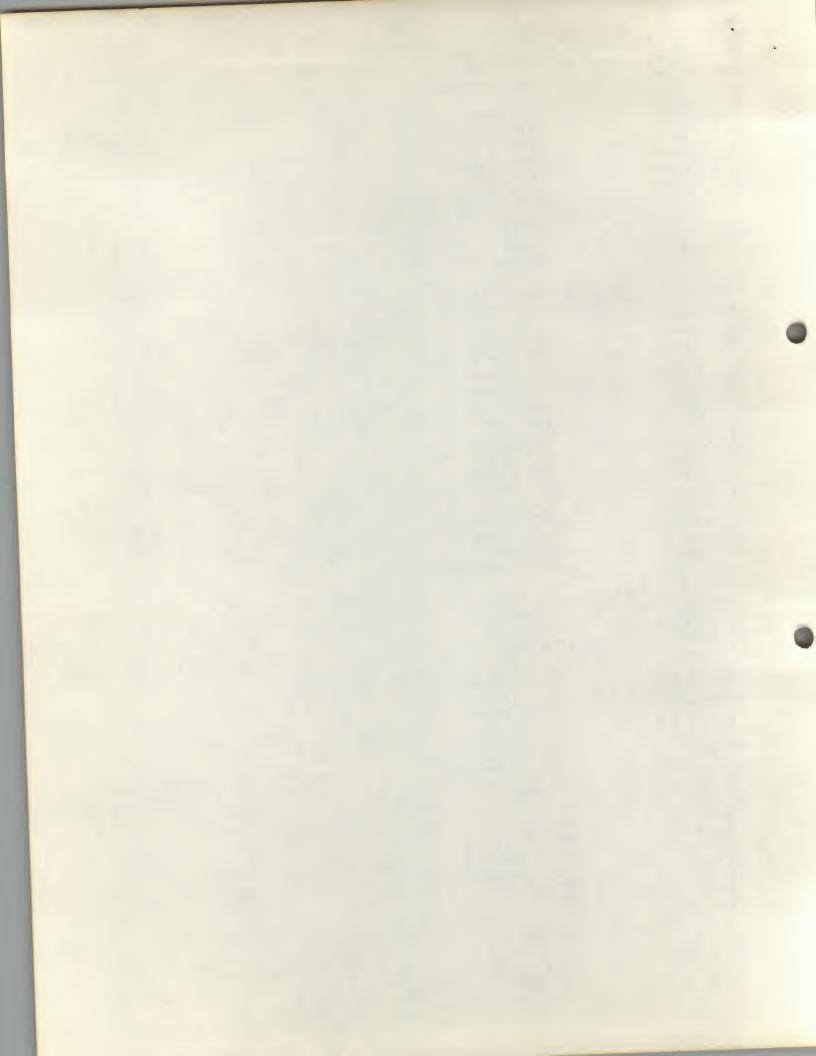
```
7217
      0000
             FOUTCN.
                    0
  7220 7300
                     CLA CLL
  7221
      1045
                      TAD HORDER
 7222 7710
                     SPA CLA
 7223 7220
                      CLA CML
 7224 1327
7225 7430
                      TAD SPLUS
                     SZL
 7226 1330
                    TAD SMINUS
 7227 4344
                    JMS OUT
 7230 4352
                     JMS OUTDG
                   TAD PERIOD
 7231 1331
 7232 4344
 7233 7300
                     CLA CLL
 7234 1045
                     TAD HORDER
 7235 7700
                     SMA CLA
 7236 5242
                     JMP FG01
 7237 7040
                     CMA
7240 3733
                    DCA I SNPT
7241 4732
                     JMS I MSNPT
7242 7240 FGO1,
                    CLA CMA
7243 1044
                    TAD EXPONT
7244 3044
                    DCA EXPONT
7245 3324
                    DCA BEXP
7246 1044 FGO2,
                    TAD EXPONT
7247 7500
                    SMA
7250 5263
                    JMP FG03
7251
    1326
                    TAD FOUR
7252 7700
                    SMA CLA
7253 5270
                  JMP FG04
7254
    4407
                    JMS I FPNT
7255
    3740
                   FMPY I TENPT
7256 0000 .
                   FEXT
7257 7240
                   CLA CMA
7260 1324
                    TAD BEXP
7261 3324
                   DCA BEXP 20
7262 5246
                   JMP FGO2
```



```
1000
          4401 16033
                          JMS I FPNT
     7.2.64
          3372
                          FMPY TENTH
    72.65
          0000
                          FEXT
    7266
          2324
                          ISZ REXP
    72.67
          5246
                          JMP FGO 2
    7270
          3734 FG04,
                          DCA I DPT
    7271
          4736
                          JMS I M2PT
    7272
          4735
                          JMS I MIMPT
    7273 7410
                          SKP
    7274
         4357
               FGO 5A,
                          JMS DIVTWO
    7275
         2044
                          ISZ EXPONT
    7276
         5274
                         JMP FG05A
    7277
         7450
                         SNA
    7300
         5311
                         JMP FG07
   7301
         4352
              FG06.
                         JMS OUTDG
   7302 1325
                         TAD MINUS7
   7303
         3044
                        DCA EXPONT
   7304
        4735
              FGO6A,
                        JMS I MIDPT
   7305
        4352
                         JMS OUTDG
   7306
         2044
                        ISZ EXPONT
   7307
        5304
                         JMP FGO 6A
   7310 5617
                        JMP I FOUTCH
        7240 FG07,
   7311
                       CLA CMA
   7312
       1324
                        TAD BEXP
   7313
       3324
                        DCA BEXP
   7314
        1045
                        TAD HORDER
  7315
        7640
                        SZA CLA
  7316 5322
                        JMP . + 4
  7317
        1046
                        TAD LORDER
  7320
        7650
                        SNA CLA
  7321
        3324
                        DCA BEXP
  7322
        7248
                       CLA CMA
  7323
        5302
                        JMP FG06+1
  7324
       0000 BEXP,
                      0
  7325
       7774 MINUST,
                     7774
  7326
       0004 FOUR,
                       4
  7327
       0253 SPLUS,
                       253
 7330
      0002 SMINUS,
                      2
 7331 Ø256 PERIOD, 256
      7120 MSNPT, MSIGN
 7333 7065 SNPT,
                     SIGN
      7063 DPT, DIGIT
7041 M10PT, MULT10
7067 M2PT, MULT2
 7334
 7335
      7967 MET.
7522 FEXPPT.
      7967 M2PT.
 7336
 7337
                      FEXC
 7340
                      TEN
 7341 0215 CARRTN, 215
 7342 0212 LNFEED.
                      212
 7343
     0305 CHE.
                      305
 7344
      0000 OUT,
                    0
7345
      6041
                     TSF
7346 5345
                      JMP .-1
7347
     6046
                      TLS
7350
     7200
                      CLA
7351
      5744
                      JMP I OUT
7352
      moon outdg,
7353
      1356
                      TAD C260
7354
     4344
                     JMS OUT
7355
     5752
                     JMP I OUTDG
                                    21
7356 0260 0260,
                     260
```

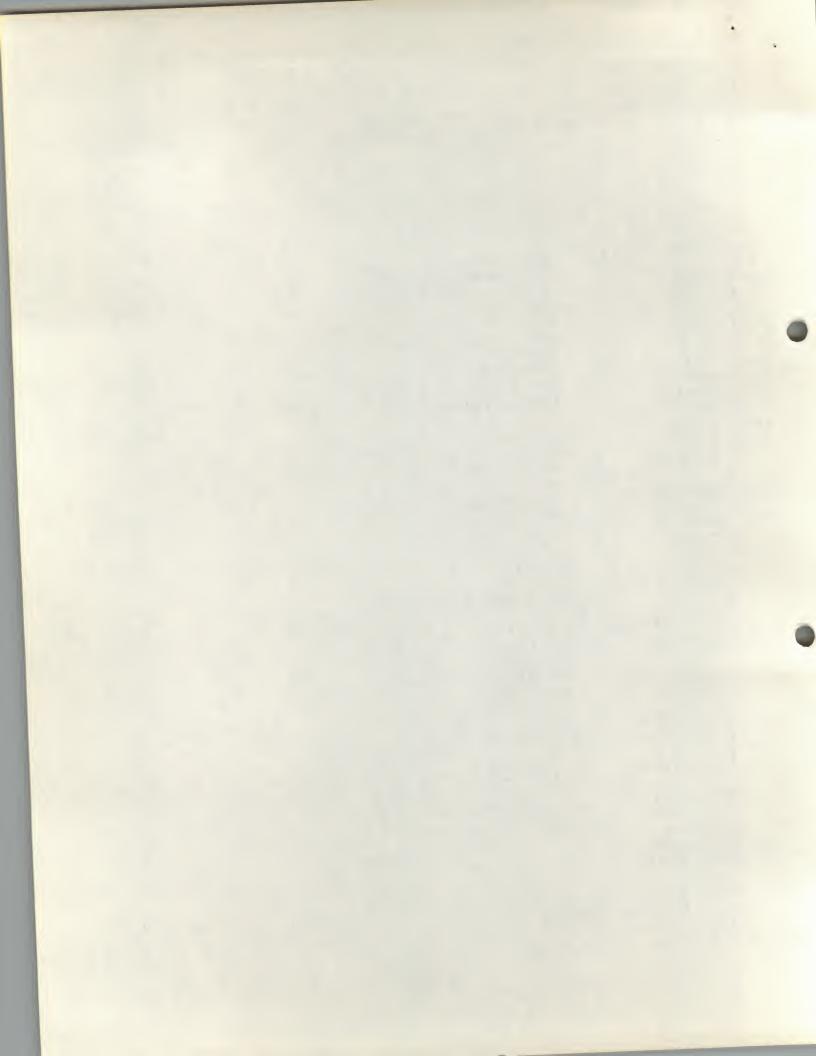


```
7357 GOVA DIVIWO.
                           0
     7360 7110
     7361 3344
                           CLL RAR
                           DCA OUT
     7362 1045
                           TAD HORDER
     7363
           7010
     7364
                           RAR
           3945
                          DCA HORDER
     7365
          1046
                          TAD LORDER
     7366
           7010
                          RAR
     7367
          3046
                          DCA LORDER
     7370
          1344
                          TAD OUT
     7371
          5757
                          JMP I DIVTWO
    7372
          7775
                TENTH,
                         7775
    7373
         3147
    7374 0000
                          3147
                          0000
               /FLOATING POINT INPUT
                *7400
    7499
         0000
               FLINTP,
                         (3)
    7401
         7240
                        CLA CMA
    7402
         3313
                         DCA PRSW
   7403
         3060
                        DCA DSWIT
   7484 4716
                         JMS I DPCVPT
   7405
        7200
   7406 1057
                        CLA
                        TAD CHAR
   7497 1312
   7410 7640
                        TAD PER
                       SZA CLA
   7411
       5220
   7412 1313
                        JMP FIG01
                      TAD PRSW
   7413
        7650
                       SNA CLA
   7414
       5222
  7415
                        JMP FIGO2
       3721
                        DCA I DPN
  7416 3313
                       DCA PRSW
  7417
        5717
                       JMP I DPCSPT
  7420
       1313 FIG01,
                       TAD PRSW
  7421
        7650
                       SNA CLA
  7422
       1721 FIGO2,
                       TAD I DPN
  7423
       7041
                       CMA IAC
 7424
       3314
                      DCA SEXP
 7425
       4720
                       JMS I MSGNPT
 7426
      1311
             FIGO3,
                       TAD C27
 7427
      3844
                      DCA EXPONT
 7430 4777
                      JMS I KNORM
 7431 4407
 7432 6052
                      JMS I FPNT
 7433 0000
                      FPUT FPACI
 7434
                      FEXT
      1057
 7435 1310
                      TAD CHAR
7436 7640
                      TAD MINUSE
                     SZA CLA
7437
      5252
7440 4716
                     JMP ENDF1
7441 4720
                     JMS I DPCVPT
                     JMS I MSGNPT
7442 1045
7443 7510
                     TAD HORDER
7444
                     SPA
     7001
7445
                     IAC
    7640
7446 5277
                     SZA CLA
                    JMP EXCESS
7447
     1046
                    TAD LORDER
7450
    1314
                     TAD SEXP
7451
    3314
                                      22
                     DCA SEXP
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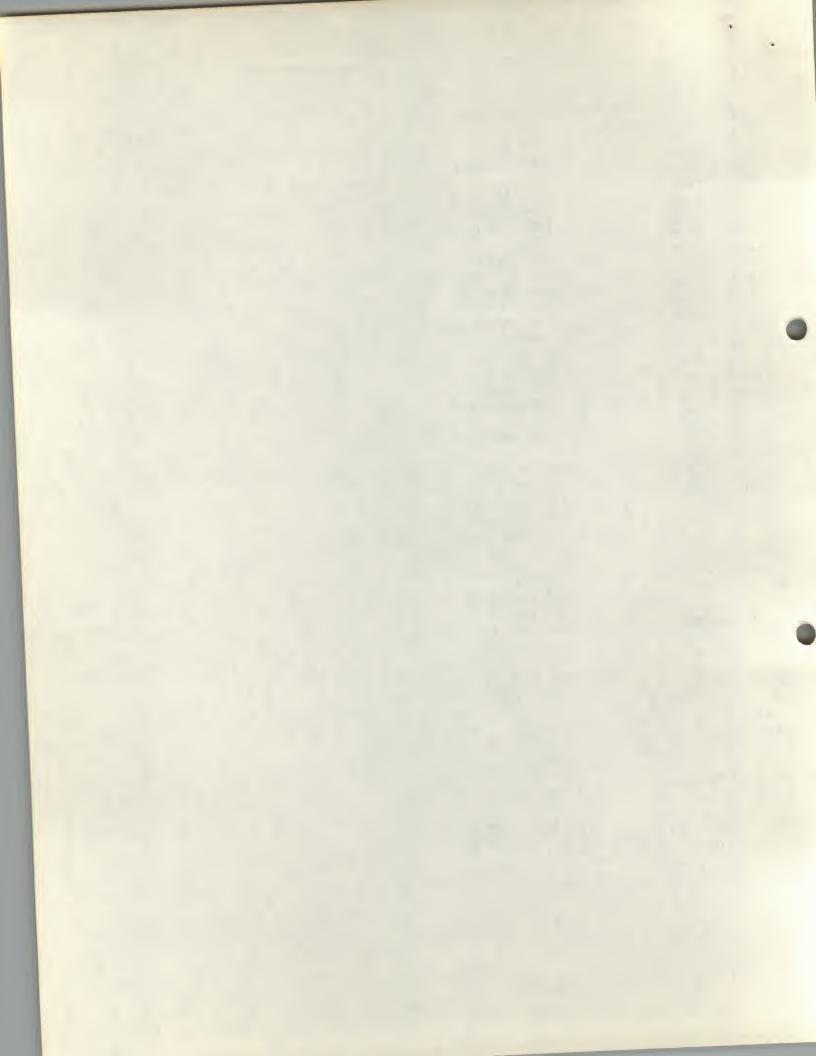


/END OF FLOATING POINT INPUT /COMPENSATE FOR DECIMAL EXPONENTS

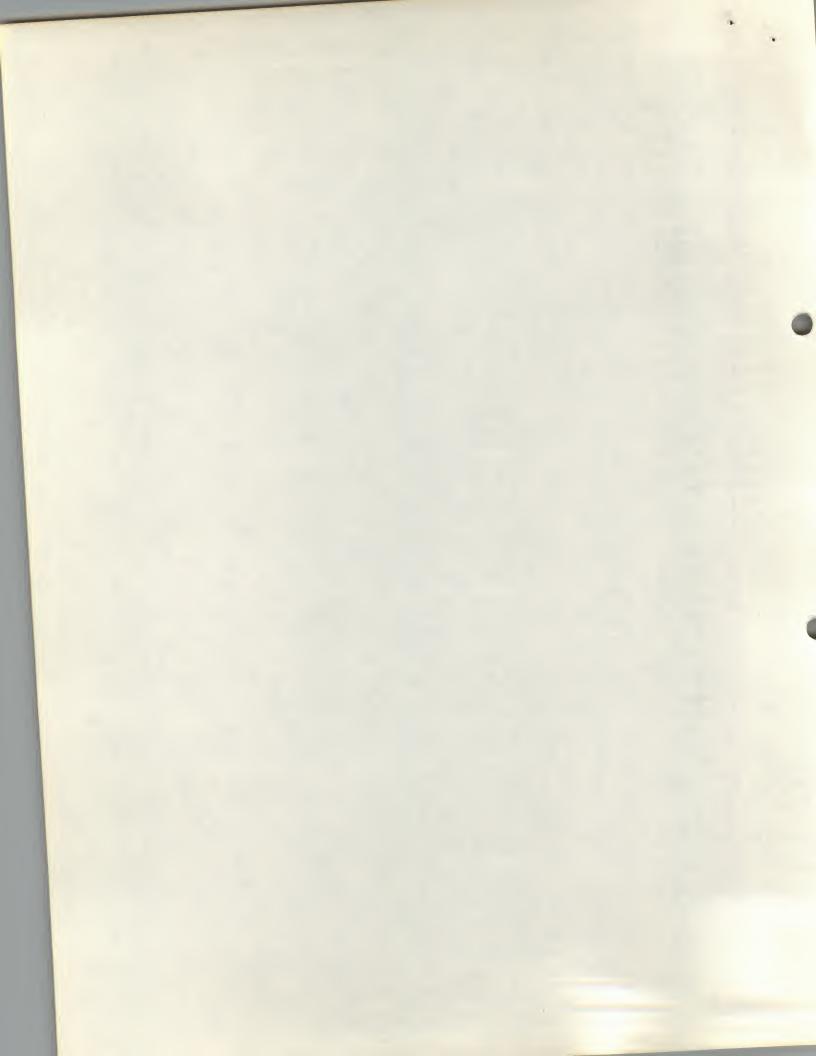
7.	452 4.	407	
7.	453 50	407 ENDF	1. JMS I FPNT
			FGET FPACI
		100	FEXT
		314	TAD SEXP
7/		150	SNA
74		76	JMP I LROU
74		99	SMA CLA
74		70	JMP FIGO4
			JMS I FPNT
		Ø 7	FMPY I TENTHL
740	54 001		FEXT
	65 23		ISZ SEXP
	56 525		IMP FAIRE
746	57 577	76	JMP ENDF1+3
7 47	~		JMP I LROU
747	*,	7 FIGO 4.	IMC I SOUT
747		4	JMS I FPNT FMPY TEN
747			FEXT
747			CLA CMA
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7475	- 4		DCA SEXP
7476	525	5	IMP ENDE
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7477			TAD C3777
7500	4. (2. 1.4)		TAD C3777 DCA EXPONT
7501			TAD C3777
7502			TAD C3777 DCA HORDER
7503	5776		JMP I LROU
750			OTT I LROU
7504		TEN.	0004
7505 7506			2400
			ନ୍ତ୍ର
7507 7510	7372	TENTHL,	TENTH
75119	1473	MINUSE,	-305
7511	9927	C27,	0027
7512 7513	7522	PER.	-256
	0000	PRSW.	0
7514 7515	0000	SEXP,	0
1313	3777	C3777,	3777
7516	205		0,11
7517	7000	DPC.VPT.	DECONV
7580	7017	DPCSPT.	DECON
7521	7129	MSGNPT,	MSIGN
· J c. [7066	DPN.	DNUMBR



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JOUTPUT THE EXPONENT
    7522
           9000
                  FEXC.
    7523
           7300
                            CLA CLL
    7524
           1044
                            TAD EXPONT
    7525
           7510
                            SPA
    7526
          7061
                            CMA IAC CML
    7527
          3044
                            DCA EXPONT
    7530
          1366
                            TAD C253
    7531
          7430
                            SZL
    7532
          1367
                            TAD C255
   7533
          4774
                            JMS I DGPT
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                            DCA HORDER
   7535
         1044
                           TAD EXPONT
   7536
         2945
                           ISZ HORDER
   7537
          1370
                           TAD M144
   7549
         7500
                           SMA
   7541
         5336
                           JMP .-3
   7542
         1371
                           TAD C144
   7543
         3344
                           DCA EXPONT
   7544
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                          CMA
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  7546
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        3345
                          DCA HORDER
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        1344
                          TAD EXPONT
  7552
        2045
                          ISZ HORDER
  7553
        1372
                          TAD MI2
  7554
        7500
                          SMA
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        5352
                          JMP .- 3
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        1373
                         TAD C12
 7557
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                         DCA LORDER
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        7240
                         CLA CMA
 7561
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                         TAD HORDER
 7562
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 7566
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7576
      7172
            LROU.
                        ROU
            *7577
7577
      6600
            XNORM.
                        6600
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	C1	2		757	
	CI	44		757	
	CS				
	CS			756	6
	C2			756	
				356	
	CS		7	511	
	C37	77	7	515	
	DEC	ON		017	
	DEC	ONV		000	
	DGP	T	7	574	
	DIG				
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	DNUN	ADD	1;	357	
	DOGG	HE		166	
	DPCS	PT	75	17	
	DPCV	PT	75	16	
	DPN		75	21	
	DPT			34	
	DSWI	Ť	00		
	DURL	AD	7.	ON.	
	ENDF		710		
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	-ACE:	55	747		
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	EXC		752	2	
F	EXPP	T	733		
	GO 1		724		
F	G02		724		
	G03				
	GO 4		7263		
	305A		1270		
	30 5 A		274		
			301		
F (606A	7	304		
76	07	7	311		
	GO 1		420		
FI	G02		422		
FI	603		426		
	G04				
FI	INTP		170		
FLO	UTP		00		
FOL	1015		00		
		73	56		
r () ()	TCN	72	17		
FPA	C1	99			
FPN		000			
HORI	DER	004			
HTEN	MP	706			
INPL	IT ·				
		714	2		



LFED 677 LFLINT 757 LNFEED 7343 LORDER 0046 LROU 7576 LTEMP 7061 MASK 7141 MINUS 7135 MINUSE 7510 MINUS7 7325 MIN9 7137 MRBOUT 7170 MSGNPT 7520 MSIGN 7120 MSNPT 7332 MULT10 7041 MULT2 7067 M10PT 7335 M12 7572 M144 7570 M2PT 7336 OPUT 6776 OUT 7344 OUTDG 7352 OUTPUT 7166 PER 7512 PERIOD 7331 PLUS 7136 PLUS12 7140 PRCHAR 6767 PRINT 7165 PRSW 7513 REMAIN 7064 RESTRT 7167 ROU 7172 SEXP 7514 SIGN 7065 SMINUS 7330 SNPT 7333	75	0,	
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